A

Philoſophical and Medical Sketch

OF THE

NATURAL HISTORY

OF THE

HUMAN BODY and MIND.

TO WHICH IS SUBJOINED,

AN ESSAY

ON THE

Difficulties of attaining Medical Knowledge,

INTENDED FOR

The Information and Amuſement of thoſe who *are*, or *are not*, of the Medical Profeſſion.

PUBLISHED FOR THE BENEFIT OF

THE GENERAL HOSPITAL AT BATH.

BY

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Πειρα σφαλερη, κρισις χαλεπη.

HIPPOCRAT.

Cauſæ proximæ inveſtigatio ad cognitionem morbi ducit ampliſſimam. CELS.

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MDCCLXXXVII.

BRITISH MUSEUM

TO THE

RIGHT HONOURABLE

LORD KINNAIRD.

My Lord,

THOSE who are acquainted with your Lordſhip's Taſte for Literature, and Love of Science, will not receive the following Eſſays with leſs Indulgence, when they are informed,

formed, that your Lordſhip not only honoured the MS. with your approbation; but even condeſcended to ſuggeſt ſome hints for its Improvement.

I have the honour to be,

With great deference and reſpect,

Your Lordſhip's

much obliged,

and moſt obedient

humble ſervant,

J. M. ADAIR.

PREFACE.

SOME of the purchaſers of the MEDICAL CAUTIONS having informed the Author, that the *Eſſay on Regimen* would have been more intelligible, had the medical reaſoning been more clear and explicit; ſeveral expedients were thought of to remove this objection, as another edition will very ſoon be publiſhed.

Thoſe authors on regimen, Dr. *Arbuthnot* particularly, who have written for general uſe, have been obliged to enter pretty fully into a ſeries of medical reaſoning; and yet the Doctor, in his ſecond edition, tells us, that his readers complained that he was not always intelligible.

The reaſon was ſufficiently obvious; though the Doctor did not remove the objection. Nothing but a knowledge of the firſt principles of an art, will ever enable us

to underſtand any part of it. *Regimen* is a very important branch of medicine, and cannot be underſtood, unleſs by thoſe who are previouſly converſant with the ſtructure and functions of the body.

This conſideration ſuggeſted the propriety of giving ſome outlines of the Natural Hiſtory of the Human Body, ſo far as was neceſſary to illuſtrate the principles of Regimen; as it was conceived that the chief reaſon why invalids are leſs diſpoſed to ſubmit to regimen, is their not underſtanding the grounds of the preſcription.

It generally happens, in the execution of a new plan, that more is done than was foreſeen or intended.

After the firſt Eſſay was in ſome forwardneſs, it was thought that a ſhort Hiſtory of the Human Mind, more phyſiological than metaphyſical, would render the plan more compleat.

This being done, it was found that the functions and operations of the body and mind would be more intelligible, if explained by a reference to their changes in diſeaſe; as things are ſometimes beſt illuſtrated by their contraries.

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The plan being thus extended, it was deemed more eligible to give a brief ſketch and explanation of the morbid affections; as the principles of regimen would thereby be more clearly underſtood, and the invalids be ſupplied with a rational plan of regulation, with reſpect chiefly to diet; and be induced, from conviction, to comply with injunctions, the reaſons of which were no longer concealed from them.

As it was propoſed to enter more minutely into a detail of regimen neceſſary for the preſervation of health, the phyſiology was extended accordingly; and what was, at firſt, intended as a mere outline, has been inſenſibly augmented into ſomething like a ſyſtem; which, however, is not ſufficiently ſo as to elucidate thoſe complicated principles which are more immediately connected with medical practice: a more elaborate, extenſive, and profound courſe of ſtudy being neceſſary for thoſe who are to perform the duties and offices of a phyſician.

When this work was undertaken, it was intended that all the Eſſays ſhould be compriſed in one volume; but it was found that it would be unfaſhionably bulky; therefore

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the Eſſays contained in the MEDICAL CAUTIONS are republiſhed in a ſeparate volume.

But, in this way, the connection between the Eſſays of this volume and that on regimen will be broken, unleſs both volumes are purchaſed: an expence, however, that will hardly amount to the douceur of a faſhionable hair-dreſſer.

Another motive ſuggeſted itſelf for publiſhing this Eſſay, which was a reaſonable expectation that nothing could ſo powerfully check the preſent prevailing propenſity to empiriciſm, as a full conviction, which this and the next Eſſay muſt afford every reader, that a ſuperficial knowledge of the medical art muſt render the practice of it very unſafe; and that neither Lady Doctors, nor *venal* quacks, male or female, were poſſeſſed even of that *ſuperficial portion*.

It may be aſked why, after having, in the moſt explicit terms, condemned popular medical treatiſes, as being the chief ſources of empiriciſm, the author ſhould add to the number? He replies, that it will have a directly contrary tendency.

It may be alledged, that if phyſic be only attainable by a long courſe of ſtudy, its principles

ciples cannot be ſufficiently intelligible to anſwer any good purpoſe, except to profeſſional men.

But this objection would equally militate againſt our attempting to attain a *moderate* knowledge of any other art or ſcience.

Does a Gentleman decline learning to dance or fence, becauſe he deſpairs of ſo excelling in either as to be able to commence dancing or fencing maſter? Is the ſtudy of aſtronomy to be neglected, becauſe we may not attain to the profound knowledge of *Newton*, or *Maſkalyne?* Or are Sir *William Blackſtone*'s Commentaries to be read by none but thoſe gentlemen who intend to follow the practice of the law?

It ought, moreover, to be conſidered, that no eſſentially uſeful knowledge can be obtained without a certain degree of attention, and due exertion of our reaſoning powers: a proof that the Supreme Being intended that a frequent exerciſe of our reaſon ſhould be the chief means of rendering us wiſe and happy.

As a curious branch of natural hiſtory, ſeveral men of ſcience and erudition have deemed the ſtudy of the human phyſiology

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an uſeful part of knowledge;[a] and though medical men have been ſuſpected of claiming an excluſive privilege to the poſſeſſion of medical myſtery; the following quotation from the works of one of the beſt men, and ableſt phyſicians, of this or any other age or country, will ſhew that this ſuppoſed profeſſional jealouſy is not general; if, indeed, it exiſt in any degree; which certainly it cannot with any man of candid and liberal ſentiments, who comprehends wherein the honour or intereſt of the profeſſion conſiſts.

"A private gentleman (ſays Dr. GREGORY[b]) "who has a literary turn, and chuſes to "ſtudy medicine as a curious and intereſt- "ing branch of natural hiſtory, will find the "hiſtory of his own ſpecies a more intereſt- "ing ſubject, than the natural hiſtory of "ſpiders and cockle-ſhells. To him ſuch a "degree of knowledge is neceſſary, as may "enable him to underſtand medical books "of merit, and to judge of the comparative "merit of thoſe men to whom he is to com-

[a] From ſome portion of the Book of *Eccleſiaſtes*, it is probable that *Solomon*, the wiſeſt of men and of kings, was, for his day, no bad phyſiologiſt.

[b] Lectures on the Duties and Offices of a Phyſician.

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" mit the important charge of his own health,
" and the health of thoſe whom he is obliged
" by the ties of nature and humanity to take
" care of. If ſuch men were to claim their
" right of enquiry into a ſubject that ſo
" nearly concerns them, the good effects on
" medicine would ſoon appear. They would
" have no ſeparate intereſt from that of the
" art: they would detect and expoſe aſſuming
" ignorance, and be the judges and patrons
" of modeſt merit.

" Caſes very often occur, when an ingeni-
" ous phyſician ſees his patient haſtening to
" certain death. He knows a remedy that
" affords a probable proſpect of ſaving his
" life; but it is uncommon, not agreeable
" to the eſtabliſhed orthodox opinion, and
" perhaps dangerous in its operation: Here
" is a dreadful dilemma. If he gives the
" remedy, and the patient dies, he is utterly
" ruined. The *dunces*, who are the moſt
" numerous in every profeſſion, are always
" at war with genius, and watch its miſcar-
" riages with an anxious and malignant eye;
" all his preſcriptions muſt remain on the
" apothecaries file, and riſe up in judgment
" againſt him; and upon any miſcarriage,

" the

" the outcry is raiſed and propagated with " the utmoſt malignity.

" The only tame and believing patients " are *the men of ſenſe*, who generally ſubmit " to their phyſician, whoever he is, with " wonderful faith and patience: while all " the midwives, nurſes, and old women, are " phyſicians; and the dignity of the moſt " ſtately of the profeſſion is often obliged " to ſtoop to the folly and caprices of ſuch " people, who are ſometimes of more con- " ſequence in making a phyſician's fortune " than all the merit he can poſſeſs."

A ſcience, it may be ſaid, which may be intelligible to men of learning, may not be ſo to others.

The experiment has been made: for beſide ſome men of letters, who have peruſed, and approved of, this and the next Eſſay in MS. it has been read by ſeveral of my female friends, ſome of them indeed of ſuperiour underſtandings, and others of plain common ſenſe; and, a few paſſages of the pathology excepted, (and which a moderate degree of attention would render ſufficiently plain) no difficulties occurred in the peruſal; whilſt the variety

variety of amuſing and intereſting anecdotes, interſperſed, enlivened the whole.

The Hiſtory of the Human Mind is peculiarly recommended to the ſerious peruſal of young people of both ſexes; and the laſt chapter of the fourth Book of the firſt Eſſay contains a variety of curious and uſeful information.

The IId Eſſay, on the *Difficulties of Studying Medicine* is publiſhed partly as an uſefu appendix to the Natural Hiſtory; but chiefly to impreſs the reader with a full conviction of a moſt ſerious truth; to inculcate which was the chief motive for this publication.

The author requeſts that the title may not deter the *ladies* from a peruſal of the ſecond eſſay; ſome of his female friends having derived both information and amuſement from it.

It may juſtly be ſuppoſed, that nothing will be found in either of theſe Eſſays that can poſſibly offend the moſt faſtidious delicacy: an exemption which the *Lady Doctors* may not always enjoy in the peruſal of *popular* practical treatiſes.

The author flatters himſelf, that his very reſpectable *ſiſters* will pardon his attempt to *diveſt* them of their medical character, as he has

has *inveſted* them with one much more important; that of being judges of the degrees of medical merit, and ſuperintendants of the department of *Regimen*; a ſtation as much more honourable than the former, as the rank of a judge is to that of a counſel.

But if all the *cogent* arguments advanced in theſe Eſſays are not ſufficient to induce the *Lady Doctors* to reſign their pretenſions to medical practice, they may be aſſured that a very careful peruſal of them will certainly qualify them to read practical books with more advantage; and this volume is recommended as a ſuitable companion to his volume of Medical Cautions, and Dr. *Buchan's* Domeſtic Medicine; as in theſe they will have the moſt eſſential branches of medicine united, and be poſſeſſed of an aſſemblage of medical knowledge fully ſufficient for *their* purpoſe.

Whilſt upon this ſubject, the author cannot avoid making a remark on the preſent whimſical ſtate of phyſic in this kingdom.

One doctor publiſhes a very large volume[c], containing, it is to be ſuppoſed, a compleat treatiſe on the practice of phyſic, by the ſtudy of which *every old woman* may be enabled to cure every diſeaſe incident to the human

[c] Domeſtic Medicine.

body, from a nervous fever or a *bilious* colic, to ſcalded ſhins and kibed heels; *certainly* to the utter annihilation of phyſicians and ſurgeons. Another doctor,[d] after the moſt *laudable* efforts to inculcate an opinion that there is nothing well grounded or permanent in medical principles, proceeds to inſinuate that *nature* and the *nurſe* are the only infallible doctors; though the doctor, *perhaps not very conſiſtently*, ſubjoins an elaborate treatiſe on the cure of *thoſe very diſeaſes* which he had previouſly conſigned to the management of the forementioned *venerable* perſonages. Thus, after one doctor had liberally imparted all his practical knowledge, and another declared there was none to impart; it might have been expected that they would have retired from buſineſs, ſupremely happy in their patriotic endeavours to relieve the public from all future taxation on the ſcore of *medical fees*; yet theſe gentlemen, it is probable, may ſtill be found in the exerciſe of their profeſſion. How this happens they alone can determine!

Repetitions, apparently unneceſſary, may occur; but they are intended to enforce cer-

[d] Dr. Moore's Medical Sketches.

tain important truths; and wherever references are made, it is with an expectation that the reader will recur to them. This recurrence will engage the attention of *fine* gentlemen and *fine* ladies; give their reading an air of ſtudy and ſerious employment, and, by creating *a habit of thinking*, may happily relieve them from that vacancy of mind, and dreadful *Ennui*, from which dreſs, balls, routs, ſcandal, and novel reading, may not always relieve beings who have *juſt* pretenſions to rationality.

To the travelled Gentlemen and Ladies, the author would obſerve, that were a work on this plan to be publiſhed either in *Paris* or *Rome*, it would be read by all who had the leaſt pretenſions to *keep good company*; as the whimſicality of its plan, and the ſingularity of its curious anecdotes, would be commented upon, with great vivacity and *erudition*, at every converſazione and petit ſoupé in each metropolis; he therefore humbly hopes, that our faſhionable *Conoſcenti* will not manifeſt leſs curioſity than their neighbours.

Having thus, he flatters himſelf, ſecured for his work a favourable reception with all people

people of faſhion in this realm; he moſt confidently relies on the countenance of all men of letters, viz. the Members of both Houſes of Parliament in both kingdoms, the Members of *all* the Univerſities, the Bench and the Bar, &c.

But the author is peculiarly aſſured of having a very numerous claſs of readers among the *Clergy*, not only as men of learning and leiſure; but for reaſons he has aſſigned in the laſt Eſſay of the ſecond edition of *Medical Cautions*; and moreover from the conſideration that he was incited to the publication of this volume, by a very reſpectable member of their body.

What ſhall he ſay to his medical brethren? It is not likely that the *ſage* Doctors will conceive they have any thing to learn at this time of day; yet he is inclined to believe that, *even to the Seniors*, a ſhort retroſpective view of the principles of the art may not have any *unfavourable* influence on the practice of it.

A phyſician of great learning, who read theſe Eſſays in MS. is of opinion, that they will be of conſiderable uſe, not only to young men entering on a regular courſe of medical ſtudy at the univerſities, but to a very numerous

rous body of medical practitioners, who never enjoyed ſuch advantage.

Eſtimating therefore his fellow-ſubjects of this realm at twelve millions, and allowing the moderate proportion of one in twelve to be poſſeſſed either of learning or taſte, (excluding midwives, nurſes, and quacks, who have neither) the author is ſometimes induced, in his momentary fits of patriotic enthuſiaſm, to form the moſt flattering calculations of emolument, (not for himſelf, for he diſclaims it, but) for the manifold charitable inſtitutions of this kingdom; and to preſent to his mind's eye a moſt glorious proſpect, not only of contributing largely toward the ſupport of every public charity, by theſe his lucubrations, but even of extending his beneficence to the *ſinking fund*; which, under the auſpices of the preſent *æconomical* adminiſtration, may probably turn out to be one of the moſt uſeful of all public charities.

Toward the completion of this great undertaking, he looks up, with a well-grounded confidence, to his *good friends* the Reviewers; who, thoſe of the medical claſs eſpecially, though they may ſometimes be a little parſimonious in the article of critical indulgence,

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are *never deficient* in the points of candour and impartiality.

The difficulty of ſelecting, and condenſing, from an immenſe maſs of materials, thoſe parts of his ſubject as were moſt intereſting and amuſing, has been greater than can be conceived by thoſe who have never made the experiment; and much labour has been employed in diveſting theſe Eſſays of technical phraſeology, and ſcientific intricacy; though the author confeſſes that he has not effected his purpoſe to his own ſatisfaction. This remark is not obtruded on the reader to enhance the merit of the attempt; but as an apology for its not having been executed with more preciſion and ſucceſs.

From the title, nothing more than a mere ſketch is to be expected, ſufficient to gratify curioſity, and explain the principles of regimen; but very inadequate to the purpoſe of qualifying the reader for medical practice; and yet there is reaſon to believe, that many have undertaken the practice of phyſic without being even poſſeſſed of ſo ſcanty a portion of preliminary knowledge; it is therefore to be hoped, that the peruſal of this volume, will induce them to have recourſe

courſe to ſuch books as treat the ſubjects of phyſiology, pathology, and noſology, on a more extenſive plan.

The author has, within a very ſmall compaſs, given a tolerably accurate explanation of all the morbid affections to which the body is ſubject; connecting them, on the one hand, with phyſiology, and on the other, with noſology; in a manner which, he flatters himſelf, will be found to be equally ſimple and intelligible, even to ordinary readers.

Though he does not feel himſelf diſpoſed to inſiſt on his claim to originality of matter, or novelty of manner; yet he flatters himſelf, that the judicious reader will exempt this publication from the humourous ſtricture of a celebrated wit,[e] who remarks, that new books reſemble apothecaries' mixtures, which are compoſed by pouring out of one bottle into another.

He flatters himſelf that the Ladies will readily pardon *an old fellow* for throwing out ſome occaſional ſtrokes of humour and pleaſantry, when he ſolemnly aſſures them that, exceedingly anxious as he muſt be to conci-

[e] Sterne.

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liate their good opinion, he could not poſſibly intend to give offence; and therefore could have no other motive than merely to enliven a ſoporific ſubject.

Whatever may be the merit or demerit of this volume, it will probably meet with ſome degree of favour and indulgence, when the reader recollects the motives for its publication.



PHILOSOPHICAL



PHILOSOPHICAL SKETCHES

Of the Natural Hiſtory of the Human Body and Mind.

BOOK I.

OF THE STRUCTURE OF THE HUMAN BODY, AND THE NATURE OF ITS FUNCTIONS.

CHAP. I.

Compariſon of Man with other Animals—Diviſion of the Subject—Of the Solids in general—Simple morbid Affections of the Solids——Of the Blood—The conſtituent Principles of the Solids and Blood—Morbid Affections of the Blood.

§. 1. I HAVE remarked in the Preface, that the nature of my plan will not admit of minute anatomical deſcription, but only of a brief and plain account of our

frame; which, though ſufficient to gratify philoſophical curioſity, is not by any means ſuch as may convey to the medical ſtudent a due degree of anatomical knowledge.

The ſtructure of the human body is in ſome points different from that of other animals, though in many reſpects ſimilar to the formation of ſome of them, as of thoſe of the monkey and dog kind.

Some whimſical philoſophers,[a] having conſidered man as a link of the great chain of animated beings, inſinuate, that though our pride has ſuggeſted to us that we are *but a little lower than the angels*, we are in truth ſo very little higher than the brutes, either in form or ſagacity, that ſome of them, particularly the *Ouran Outang*, and the *monkey*, reſemble us very much, not only in their outward form and internal ſtructure, but in the degree of their underſtanding; and this allegation may probably have acquired a greater degree of credit from the daily inſtances of intelligent horſes, knowing dogs, learned pigs, ſagacious birds, and muſical mice.

[a] Swift in Gulliver's Travels, and Lord Monboddo in his Origin of Language.

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But I would not affront the ladies by giving my feeble ſanction to this opinion, nor contribute in any degree to leſſen the dignity and ſelf-importance of the faireſt part of the creation; nor am I much inclined to adopt the hypotheſis of the ingenious Governour *Holwell*, lately publiſhed, that our bodies are inhabited by the ſpirits of rebellious angels, and that to the female form and character have been allotted the meekeſt and mildeſt; and which conſequently have the *leaſt* of the devil in them.

However objectionable this opinion of the Governour's may be, it is nevertheleſs much more favourable to the ladies, than the illiberal doctrine of Mahometan countries, which alledges that females have no ſouls; or the hypotheſis advanced by ſome choice ſpirits of the preſent age, who are ſo little diſpoſed to allow that we are even poſſeſſed by diabolical ſpirits, that they diveſt our natures of whatever may be deemed either ſpiritual or immortal.

Even naturaliſts ſeem, of late, to have given ſome ſanction to the latter opinion, by placing the human ſpecies in the ſame claſs with the whale, &c. But of all theſe

ſyſtems, it is probable that ladies of rank and faſhion will deem the Governour's the leaſt exceptionable; convinced, as they muſt be, that *Perſonages of the ton* have an excluſive claim to the virtues of meekneſs and ſelf-denial, as the genuine fruits of polite education; whilſt the middling and lower ranks of females are too much under the influence of rude and untutored nature, to diſguiſe or ſuppreſs their conſtitutional propenſities, or conceal the workings of the *dæmoniacal* ſpirit.

By ſuch an arrangment as the Governour has adopted, much more reſpectable to the ladies of every rank and denomination than that of the celebrated *Linnæus*, we may place an effectual barrier between man and brute; and I flatter myſelf it may operate as an additional motive to thoſe of morality and religion; and induce us ſo far to ſupport the dignity of our nature, that though we may not be able totally to ſubdue the *ſpirit* that is within us, we may at leaſt avoid whatever may tend to evince our alliance with the brutes.

Candour, however, obliges me to confeſs, that of all animals, infant man is the moſt helpleſs; and that, in every ſtage of life, we manifeſt

manifeſt fewer marks of natural inſtinct or ſagacity, than the brutes in general; or even than vegetables; if an ingenious phyſician[b] be not miſtaken in the attributes he aſſigns to vegetable nature.

It may have been ordained by the Supreme Author of our being, that, to compenſate for this defect, we ſhould be obliged to exert our rational faculties for our preſervation: but it probably was not the intention of infinite Wiſdom and Goodneſs, that, totally deſerting nature, we ſhould entirely become the children of art.

§. 2. The natural hiſtory of the human body comprehends *anatomy*, or an examination of the ſtructure of the ſeveral parts of the body, and *phyſiology*, or an explanation of the nature and uſes of its ſeveral organs.

Though the diſſection of human bodies has been reprobated by ignorance and ſuperſtition; yet, without a very conſiderable degree of anatomical knowledge, it would be as impoſſible for a phyſician to diſcover and remove diſeaſes, as it would be for a watch-maker to rectify a watch without un-

[b] Dr. Percival.

derſtanding its ſtructure; and yet quacks of all denominations are ſo preſumptuous as to undertake the taſk, though totally ignorant of the nature of the human body.

A mere knowledge of the anatomy of our bodies would only be an object of philoſophical curioſity, but not of medical enquiry, without an explanation of the offices of the ſeveral parts or organs; and therefore there is an intimate connection between anatomy and phyſiology.

§. 3. All the *Solid* parts of our bodies are compoſed of fibres or threads, of different ſizes and degrees of ſtrength and firmneſs, curiouſly interwoven with each other, by tranſverſe threads of a finer texture than the fibres they tie together. The fibres are perpetually bedewed by a fine lymph, to preſerve their ſoftneſs and flexibility. The reader may form ſome idea of the almoſt infinite ſlenderneſs of an animal fibre, by recollecting that there are ſome animals ſo ſmall that they are only viſible through a microſcope; and yet theſe muſt have many organs compoſed of myriads of fibres.

Some

Some of the fibres of our organs are very delicate and ſlender, as thoſe of the brain and ſpinal marrow; others are very firm and rigid, as thoſe which compoſe the bones and cartilages, or griſtles; others are formed into red maſſes of fleſh, called muſcles, by which our limbs and other organs are moved; and theſe muſcular fibres alſo conſtitute a part of various internal organs, as of the heart almoſt entirely, and of the ſtomach, inteſtines or bowels, arteries, &c. in part; but the chief part of the body, is compoſed of a fine web-like ſubſtance, called *Cellular Membrane*; the threads of which not only unite the muſcular fibres with each other, but form the ſkin and other membranes; and compoſe the hollow organs of the body, as the ſtomach, inteſtines, lungs, arteries, veins, glands, &c. The cavities of the body are alſo lined with this membrane; it forms the ligaments of the joints, and the coverings of thoſe detached portions of the brain called nerves; indeed it has been ſuppoſed by ſome that even the bones and muſcles are compoſed of theſe cellular threads in their original formation.

The

§. 4. The ſimple morbid affections of the animal fibres are various. A fibre may be too groſs or too delicate and ſlender, too hard or too ſoft, too rigid or too pliable; it may be ſo ſtretched as to have its elaſticity weakened or deſtroyed; it may be broken by violence, or its ſubſtance may be eroded by various acrid or corroſive cauſes. Theſe may be conſidered as the ſimple or fundamental cauſes of the manifold diſeaſes of the human body; and as all the ſolid parts of the body are compoſed of theſe fibres, they are conſequently liable to all the morbid changes of the ſimple fibre.

§. 5. The *Blood* is a red glutinous fluid, from whence all the other humours are formed; and as it alſo ſupplies the matter from whence the ſolid parts are formed, the conſtituent principles of both muſt be the ſame.

Oil is ſuppoſed to conſtitute the chief part of the globules, or red part of the blood; it forms the marrow of the bones; the fat lodged under the true ſkin; in the cellular membrane; in the omentum or cawl, and in other parts of the body.

Water

Water is not only a conſiderable principle both of our humours and ſolids, but even of the bones.

Earth not only forms a great part of the ſolid organs, but is alſo a conſtituent principle of the blood and other humours.

The *Salt* contained in the ſolid and fluid parts of our bodies reſembles that which is diſtilled from hart's horns and other bones, and is called ammoniacal.

Theſe *principles* are derived from our animal and vegetable foods, and our drinks. It is ſuppoſed alſo, that air, a ſmall portion of iron, and fire, are conſtituent parts both of our ſolids and fluids.

§. 6. Many diſeaſes were formerly attributed to ſpontaneous changes of the blood and humours; in many caſes they were ſuppoſed to be too thick and viſcid, in others too thin, acid, alcaline, &c.

The phyſicians of the preſent age, more attentive to facts, more accurate in their experiments, and more cautious in their concluſions, without abſolutely denying that our fluids may acquire bad qualities; yet alledge that they are rather to be conſidered as effects than cauſes, and are chiefly to be attributed

attributed to ſome previous morbid changes of the organs which prepare, circulate, and ſecrete them; and as a proof of this, remark, that in thoſe diſeaſes which proceed from infection, as ſmall-pox, meaſles, plague, malignant and putrid fevers, the nervous ſyſtem and vital powers are affected, before any manifeſt change takes place in the fluids. It is not improbable, however, that our humours may be ſo changed by diet and other cauſes, as to have ſome ſhare in the production of diſeaſes. We know that ſcrophulous and other family taints remain long latent before they break out into diſeaſe; but whether they lurk in the fluids or the organs, will not, perhaps, be ever certainly determined.

CHAP. II.

Motion eſſential to Life—Its prediſpoſing and occaſional Cauſes—Senſibility and Stimulus, —Action and Reaction.

§. 7. AS the life of man ſubſiſts by a variety of motions, ſo thoſe motions muſt be produced by ſome cauſe exciting

citing the ſeveral organs. This *cauſe*, which we ſhall find to be of different kinds, I ſhall diſtinguiſh by the name of *ſtimulus* or *ſpur*. When this ſtimulus acts in a manner conſiſtent with health, it is ſaid to be natural; if it diſturbs the body, it becomes morbid, or the cauſe of diſeaſe, and is therefore preternatural.

That the ſtimulus may excite an organ to motion, it is neceſſary that the organ have ſenſibility or feeling; or that there be ſome quality, by means of which it ſhall move or react upon the ſtimulating cauſe.

The power of the organ to move may be called the prediſpoſing, or conſtitutional cauſe; and the ſtimulus the occaſional or exciting cauſe

I have choſen this method of explaining the movements of the various organs of the body, becauſe it is ſimple and intelligible to every capacity; and the reader is requeſted to hold this explanation in mind, as much uſe will be made of it in the following chapters.

CHAP.

BOOK II.

OF THE ANIMAL FUNCTIONS.

CHAP. I.

Of the Functions of the Body, and its Qualities—How diſtinguiſhed—The Animal Functions—Senſation, the Sources and Inſtruments of it—Cauſes of morbid Senſibility—Muſcular Motion—Its Defects—External Senſes—Seeing—Hearing—Smelling—Taſte—Touch—Remarks on the morbid Affections of the external Senſes—Sleep, its effects—Important Remark.

FOR the ſake of preciſion, the functions or offices of the organs of our bodies are diſtinguiſhed from each other; but they are ſo complicated, that no accurate diviſion of them can be made. They are, however, generally divided into *Animal*, *Vital*, and *Natural*, each of which will be explained when we treat of them.

The *Qualities* are ſuch circumſtances as relate to the general aſpect or appearance of the body, or of particular parts; as the countenance, eyes, colour of the ſkin, appearance of the excretions, &c.

The

§. 8. The *Animal functions* are ſo called, becauſe they are the ſources of animation, and of ſenſation or feeling, and motion.

The *Organs* ſubſervient to the animal functions are:—

1*ſt*. The *Brain* ſituated in the head, and defended by a bony caſe. Its ſubſtance is very ſoft and pulpy. Anatomiſts divide it into two portions; the ſmaller portion, which is placed in the back part of the head, has by ſome been deemed the chief ſource of the vital motions. There are ſeveral cavities or ventricles in the brain, into which a fine fluid is ſeparated. The brain is ſupplied with blood by two large arteries; the branches of which are diſtributed to every point of its ſubſtance, in ſuch a manner as to leſſen its motion, and break its force, that the delicate ſubſtance of the brain may not be injured by the ſtrong vibrations of the arteries.

2*dly*. The *Spinal marrow* is a portion of the brain, which paſſes by an aperture in the ſkull through the neck and back, and is every where defended by a bony flexible caſe.

The brain is covered with membranous coats, which alſo deſcend and ſurround the ſpinal marrow.

The

The brain and ſpinal marrow ſend off ſmall portions of their ſubſtance, ſurrounded by a part of their membranes.

Theſe portions are called *Nerves*, of which ten pair iſſue from the brain itſelf, and thirty pair from the ſpinal marrow; and thoſe eighty nerves, divided and ſubdivided into an almoſt infinite number of ſmall cords, are diſtributed to every point of the body.

The nerves are not elaſtic, nor do they ſhrink or contract, as muſcular fibres do, when ſtimulated. It is ſuppoſed that ſenſation is confined to the pulpy part of the nerve which is derived from the ſubſtance of the brain; but that their tough coverings or coats have no feeling, and that when a nerve enters an organ, it throws off its coats, and becomes then qualified to feel.

It has been alledged that the nerves are hollow; but no cavities or orifices have been ſeen in them with the beſt microſcope.

The brain has generally been ſuppoſed to be the ſeat of the ſoul or mind; to which ſome anatomiſts have aſſigned an habitation on a ſmall prominence of the brain, called the *Pineal* gland.

The

The brain and ſpinal marrow are the ſources of that faculty which is termed *Senſation* or feeling; and the nerves are the inſtruments of communication between theſe organs and every other part of the body.

Though theſe organs, being the ſources of ſenſation and motion, and conſequently of life, may be termed vital, yet there are ſome animals, eſpecially flies and inſects, which ſurvive many hours after their heads are cut off.

Different opinions have been held concerning the manner of nervous communication. The moſt general is that which ſuppoſes the nerves to convey a fine fluid, which, by its flux and reflux from and to the brain, conveys an animating principle to all the other organs; and reconveys to the brain, and through that to the ſoul, the impreſſions of ſenſation in every part of the body.

Some phyſiologiſts alledge that the nerves are ſolid chords, and, like muſical ſtrings, perform their office by a kind of vibration.

It is more probable, however, that the electric fluid is the medium employed; as its rapid movements render it peculiarly fit for that almoſt inſtantaneous communication

which

which takes place between the brain and the other organs.

This opinion is rendered more probable from the power which the *Electric eel* and other fiſhes have of giving the electric ſhock; and a very ingenious phyſician[c] informs me that a paralytick patient of his had repeatedly complained to him of ſenſations ſimilar to thoſe of the electrical ſhock.

The reader will recollect the principle I aſſumed in the preceding chapter, reſpecting irritation and ſtimulus, which I ſhall now illuſtrate by examples.

§. 9. *Senſation* or *feeling* may be defined a certain conſciouſneſs in the mind produced by an impreſſion made on a nerve. But we ſhall ſee hereafter that many impreſſions may be and are made on the nerves of many organs, without being attended with any conſciouſneſs of the mind; as in all the organs of involuntary motion.

If we touch a hard body, the impreſſion is inſtantly conveyed to the brain, and the mind forms an idea correſponding to that impreſſion; and determines whether it is rough or ſmooth; what is its figure, form, &c.

[c] Dr. Falconer.

Grateful foods or drinks excite an agreeable ſenſation in the palate and ſtomach, by ſtimulating the nerves of thoſe organs, and the impreſſion is immediately perceived by the mind.

Baron *Haller* and others have aſſerted that many organs are totally deſtitute of feeling; as the bones and their coverings, the tendons, ligaments, cellular membrane, and other membranes of the body (except the true ſkin) and even the membrane which covers the pupil of the eye; that many of the principal organs, as the heart, liver, and ſpleen, have much leſs ſenſibility than is commonly ſuppoſed; and that the muſcles and the true ſkin, and a continuation of it to the tongue, throat, windpipe, inner ſurface of the ſtomach, inteſtines, &c. are the only parts that have a very acute ſenſe of feeling. This opinion has been ably diſputed; but even admitting the fact, we know that ſeveral of the ſuppoſed inſenſible organs are found to be exquiſitely ſenſible in diſeaſe, as in pleuriſy, rheumatiſm, gout, gravel, &c.

The nerves have *ganglions* or little knots formed upon them in different parts of their courſe from the brain: ſome have ſuppoſed

that they act as *little hearts* to push on the nervous fluid.

Without sensation we should be mere inanimate machines, and inferiour in the scale of beings even to vegetables; some of which shrink from the touch, as the sensitive and other plants, and thereby manifest a sense of feeling.

There is so intimate a connection between soul and body; and there are such various degrees of sensibility imparted by nature to each; that there is just reason to believe that the praises so lavishly bestowed on stoical indifference, firmness of mind, and contempt of danger, as indications of superiority of soul, have often been misapplied; as these admired qualities seem to be chiefly the result of constitutional insensibility both of body and mind.

Of such impenetrable stuff have many of the heroes and philosophers of every age and country been composed, who, with a different set of nerves, would only have ranked with that lively, pert, and insignificant order of beings, the petite-maitres and fribbles.

§. 10. Sensations communicated to the brain through the nerves may be either too strong

ſtrong or too weak, when compared with the degree of the ſtimulus which excites them; or the impreſſion made on the mind may not correſpond with the nature of the exciting cauſe; and from one or other of thoſe ſimple morbid affections, all nervous diſeaſes muſt proceed. And as the nerves are moſt intimately interwoven with the other fibres of which the various organs are compoſed, it is obvious that, beſides the ſimple affections enumerated, (§. 4.) and which are independent of ſenſation, every ſenſible organ of the body muſt be ſubject to nervous diſeaſes; though the heart, ſtomach, inteſtines, and muſcles, as being endowed with a greater degree of irritability, are ſuppoſed to be liable to them in a more eminent degree.

The change which is made upon the nerves of different organs by their natural ſtimuli, may perhaps be beſt underſtood by the effects of morbid ſtimulus. Thus if a nerve be preſſed upon and ſtretched beyond its natural tone, or bruiſed, wounded, or eroded, a ſenſe of pain is produced in proportion to the degree of ſenſibility, and the violence of the exciting cauſe. The horrible effects of the rack afford an example equally dreadful and

diſgraceful to humanity, of the conſequences of irritation in the extreme. Thoſe ſtimuli which excite either ſimple ſenſation, or that which is poſitively grateful or pleaſurable, act probably in the ſame way as thoſe which produce the various degrees of diſagreeable or painful feelings; and the ſenſation of tickling affords a proof, that the difference between pleaſure and pain is only in degree.

It may be proper to remark here, that in all theſe nervous affections, the fault may be either in the origin of the nerves, in the nerves during their courſe, or after they have entered into the organ which they animate and move; or, without any previous fault of the nerve, it may be owing to a morbid cauſe acting upon them: this I ſhall explain by ſome examples.

Some perſons of delicate temperaments have naturally very irritable nerves, and are therefore eaſily diſturbed by a very ſlight cauſe: hence hyſteric faintings, and convulſions, from ſurpriſe, &c. Such diſeaſes are peculiarly termed nervous, to diſtinguiſh them from other diſeaſes which proceed rather from ſtrong irritation than weak nerves.

Were

Were a ſtrong man to be thrown into convulſions by poiſon or any violent ſtimulus, we ſhould not ſay that this patient is nervous; but that he is not deſtitute of feeling. A perſon whoſe nerves are conſtitutionally ſtrong, may have them ſo weakened by diſeaſes, as to become what is vulgarly called *very nervous*. Affections from theſe cauſes are not ſo genuinely nervous as the former, becauſe they proceed chiefly from the violence of the cauſe.

Many diſeaſes proceed from an oppoſite ſtate of the nerves, viz. Senſibility, and muſcular motion, much weakened or totally deſtroyed. Some of this order of diſeaſes may either follow genuine nervous diſeaſes, or thoſe that have been inveterately painful: thus an hyſterical convulſion, or an epileptic fit, often end in a temporary apoplectic ſtupor; and rheumatiſm and gout frequently terminate either in a paralytic weakneſs of the limbs, or an inveterate palſy.

It is not conſiſtent with my plan to enter into a minute conſideration of cauſes; it may be proper, however, to obſerve, that as the former claſs of affections proceeds either from exceſſive ſenſibility or violent ſtimulus;

ſo the latter proceed from ſedative cauſes, or ſuch as either immediately or remotely weaken the ſenſibility or powers of motion. A ſtimulant in a certain degree may become a ſedative in a higher degree. Thus a ſpoonful of brandy will ſtimulate; a pint of the ſame liquor, if ſwallowed ſuddenly, may ſuſpend all ſenſe, motion and life, by bringing on an apoplexy.

The degrees of paralytic weakneſs are manifold; and beſides thoſe of the muſcles, many of the muſcular cavities and ſmall veſſels, as the heart, lungs, ſtomach, inteſtines, &c. are more frequently affected by ſlight degrees of paralytic weakneſs than is *commonly ſuppoſed.*

Before we finiſh theſe remarks on morbid affections of the nerves, it will be proper to take ſome notice on the extenſive influence of ſympathy in diſeaſe, though ſcarcely diſcernible, yet always operating ſilently, in the healthy body.

§. 11. *Sympathy* is that communication of ſenſation which is eſtabliſhed, through the brain, by means of the nerves, between one organ and another. Some have ſuppoſed that particular organs ſympathize with each other, without

without the mediation of the brain; and in ſome inſtances this may not be improbable. When the cauſe of diſeaſe is in one organ, the ſympathetic effect is often extended to another. Thus head-ache, an inflammatory pain of the kidneys, bowels, or gall-duct, often produce vomitings: ſickneſs, from irritation of the ſtomach by an ingrateful ſtimulus, may produce head-ache, giddineſs and dimneſs of ſight, cough in the lungs, and a ſenſe of ſinking, anxiety and palpitation of the heart: worms in the ſtomach often produce itching of the noſe, and puffing of the upper lip: a grating ſound in the ear has created numbneſs of the teeth: tooth-ache has produced blindneſs, deafneſs, and loſs of ſpeech: a bruiſe of the thumb has been followed by violent head-ache: a bruiſe of the toe, a nail run into the foot, and a burn by ſcalding coffee, have brought on a fatal locked jaw; and tickling has in one perſon produced fainting, in another epilepſy, and in a third fatal convulſions.

Beſides theſe and many other inſtances; many of the moſt diſtreſſing, and, to the ignorant, alarming ſymptoms, in fevers and nervous diſeaſes eſpecially, though ſometimes

times in others, proceed from ſympathy; by which the genuine nature and ſeat of the diſeaſe is often very much diſguiſed and obſcured, and which can only be diſcerned by men of ſkill.

§. 12. The *Brain* is not only the ſource of ſenſation, but of muſcular motion. It may eaſily be conceived that the brain and ſpinal marrow, beſide all the diſorders of the ſimple ſolids, (§. 4.) from the delicacy of their texture, the nature of their functions as the grand ſources of ſenſation and motion, and their immediate and moſt intimate connexion with the mind, muſt be ſubject to manifold and important morbid affections: Hence it is, that ſeveral of the moſt violent and fatal nervous diſeaſes originate in the brain or ſpinal marrow; whilſt a multitude of others, thoſe eſpecially which are effects of febrile commotions of the circulating ſyſtem, make often an early and dangerous impreſſion on the functions of the brain; to which we may add, its manifold ſufferings from irregular affections of the mind, and its ſympathetic communication, by means of

of the nerves, with all the organs endued with ſenſation, or ſuſceptible of motion.

It is a curious fact, that though it might reaſonably be expected that conſiderable injuries of the brain muſt always be followed by great weakneſs, or total abolition of ſenſe and motion; yet, in ſome caſes, neither have been affected, and the patients have ſurvived, after wounds and impoſthumations of this delicate organ, and in one inſtance after half of the brain was deſtroyed:——A caution againſt precipitate prognoſtic, even in the worſt poſſible caſes.

§. 13. The *Muſcles* are organs of different forms, by which various motions are performed. They are about 400 in number. Many of them are fixed at each end to bones, by means of white tough cords, called *tendons*; and move the trunk and limbs in a variety of directions: Others are appropriated to the movements of the eyes, the tongue, &c. Beſides theſe, there are internal muſcular organs, as the heart, &c.

The manner in which muſcles ſwell, contract, and move the ſeveral organs, is truly wonderful; but has not yet been ſatisfactorily explained. It probably depends on a law

law of the ſyſtem, which eſtabliſhes a certain relation between the organ and its natural ſtimulus; and by which certain impreſſions muſt always produce correſponding motions.

When a muſcle acts, its fibres are not only conſiderably ſhortened, but its belly becomes tenſe and hard. Every muſcle has either its antagoniſt muſcle, or ſome other counteracting cauſe. Thus the various limbs and joints are bended by one ſet of muſcles, and extended by another; the former being generally ſomewhat more powerful, except thoſe of the head, neck and back. Thoſe muſcular fibres which conſtitute ſome of the principal organs, as the throat, ſtomach, inteſtines, heart, &c. have alſo their antagoniſing powers; chiefly their natural ſtimuli, as will be ſeen hereafter. During health, there is a pretty exact balance preſerved between theſe oppoſite powers; but the predominance of the one over the other becomes a very frequent cauſe of diſeaſe.

The rapidity of muſcular motion is aſtoniſhingly great; the pulſe in ſome fevers is above 150 in a minute; ſo that the heart muſt both fill and empty itſelf in two thirds of a ſecond; and it has been found by experiment,

ment, that 1500 letters may be pronounced in a minute. The progreſſive muſcular motion of animals is exceedingly great, as of the pigeon, the horſe, and the dog: even in man it is very great; and we are told by *Thevenot*, that the Perſian couriers run 90 miles a day. The muſcular ſtrength of ſome men is almoſt incredible: *Auguſtus* II. king Poland could twiſt and break horſe-ſhoes by the force of his hands; and ſome men have ſtopped the motion of two, four, and even ſix horſes, when in full career. Even in diſeaſes, eſpecially madneſs, muſcular exertions are aſtoniſhing.

Some celebrated anatomiſts have ſuppoſed that muſcles have a power of motion which is independent of ſenſation, and this faculty they term *irritability*, to diſtinguiſh it from ſenſibility; and it is certain that the heart, and ſome other muſcular parts of animals, move or contract for ſome time after death, when pricked by a ſharp inſtrument, even after they cannot have any communication with the brain. But, to avoid minute diſtinctions in a popular treatiſe, I ſhall uſe both terms indiſcriminately.

Some

Some phyſiologiſts have confined the power of reaction, contraction or ſpaſm, to muſcular fibres only, which may partly depend on their ſpring or elaſticity mentioned above, and partly on their ſenſibility; but as almoſt all the cavities of the body are partly compoſed of muſcular fibres; ſo they are ſuſceptible of contraction and motion when ſtimulated.

Some have conjectured, that the nerves of ſenſation and motion are different; becauſe in palſies ſenſation is loſt, whilſt the power of motion remains; and the reverſe.

Leſs nervous energy is neceſſary for ſenſation than for motion; thus dying perſons retain their external ſenſes, though totally unable to move: Hence thoſe diſeaſes which are accompanied with loſs of motion are more dangerous than when ſenſation only is loſt.

Beſides thoſe ſimple affections of the fibres, (§. 4.) and of the nerves, (§. 8.) manifold diſeaſes of muſcles and muſcular organs proceed from various degrees and combinations of thoſe ſimple affections, and are termed ſpaſmodic, convulſive, paralytic, &c.

Many wonderful effects have been produced in the nervous and muſcular ſyſtem, which,

which, in ages of ignorance, were attributed to magic, witchcraft, or dæmoniacal poſſeſſion. Thus from the violent impreſſions of anger, terror, love, &c. perſons have been thrown into dreadful convulſions, ſeized with extaſies, or rendered ſtiff as ſtatues, often with a total deprivation of ſenſe and recollection.

Nervous affections are ſometimes inſtantaneouſly communicated from one perſon to another: thus *Kaw Boerhaave* tells us, that a girl in the orphan-houſe at Haerlem being ſeized with convulſions, all the other children who were preſent were affected in the ſame manner.

§. 14. The *motions of the body* have been divided into voluntary and involuntary.

The *Voluntary* motions are ſuch as depend on the influence of the will: thus if I will to move my arm, various muſcles contract inſtantaneouſly, and by their combined power, perform preciſely that degree and kind of motion which I intend.

Involuntary motions are thoſe which are performed without the direction of the will, as thoſe of the heart, &c.

It

It would have been very dangerous to have ſubjected the movements of all the organs to the direction of will or mind, the faculties of which are often employed in the various duties of life, or deeply engaged in abſtract ſpeculations; and are, in a great degree, ſuſpended during ſleep: many operations, therefore, of the animal œconomy are performed without the direction or conſciouſneſs of the mind: ſome extraordinary inſtances have however been related of perſons who had the power of ſuſpending and renewing the motions of the heart at will. Thus St. *Auguſtine* knew a prieſt who could, at will, ſuſpend all his ſenſes; and Dr. *Cheyne* mentions a perſon who could not only ſuſpend all the powers of ſenſe and motion, but renew them at pleaſure.

Even the muſcles deſtined to voluntary motion are ſometimes contracted without the interpoſition of the will: thus when aſleep, or even when awake, we are often, by a ſenſe of inconvenience or uneaſineſs, excited to change our poſture, and ſome perſons walk in their ſleep.

As every organ has its proper ſtimulus, the will therefore is the ſtimulus to the voluntary

luntary muſcles; and as we proceed, the ſtimuli of the organs of involuntary motion will be enumerated.

The bones and joints being connected with voluntary motion, it may be proper to offer a few remarks on them in this place.

§. 15. The *Bones*, which, from their firm and rigid texture, afford ſupport to the other ſolid organs, are of different forms and ſizes; many of them are covered with a tough membrane; and ſuch of them as form joints, have their ends covered with *cartilages* or *griſtles*, to render their motions more eaſy, and are united by tough and ſtrong membranes, called *Ligaments*, which, by their pliancy, give the bones a free motion on each other. The bones are not ſolid, but ſpongy in the middle; but they are much ſtrengthened by a layer of firm hard plates which cover them.

The muſcles, paſſing from one bone to another, are fixed to each by tendons, in ſuch a manner as to render their movements eaſy, quick, and ſufficiently powerful. The various combinations of the muſcles in performing the different motions of the neck, back and limbs, are exceedingly curious.

The

The bones and ligaments are ſubject, not only to all the diſeaſes of the ſimple ſolids, (§. 3.) but to ſome which reſult from faults of ſecretion.

Thus the bones may be ſo brittle, as to be eaſily broken, their ſubſtance may be eroded and corrupted; and in ſome inſtances, bones have become ſo ſoft, as to be totally unable to ſuſtain the body. The ligaments may be too lax or over-ſtretched; hence luxations; or they may become ſo rigid as to render the the joints inflexible, &c. Some ſoft organs acquire the rigidity and firmneſs of bones.

Whilſt we are on the ſubjects of ſenſation and motion, it may be proper to conſider the ſenſes of ſeeing, hearing, ſmelling, taſte, and touch.

§. 16. The *Eyes* are of an oblong ſpherical form, conſiſting of different layers of coats or membranes; containing, in different chambers, the watery, glaſſy, and cryſtalline humours. The eyes are amply ſupplied with nerves; the chief of which, termed the optic, are ſpread upon the retina. Several muſcles are employed in moving the eyes in a variety of directions, for the purpoſe of enlarging the

the field of viſion: The force of the rays of light is partly weakened by the eye-brows and eye-lids.

The eye is an organ ſo neceſſary to the preſervation of animals, that few, even of inſects, are without it. Some ſhell-fiſh have eight, and flies &c. have five; but notwithſtanding the ſtory of the Cyclops, it is not probable that any animal has leſs than two. The ſurface of the eye is perpetually moiſtened by a fine fluid, which is conveyed into the noſtril by a duct. Its paſſage is ſometimes interrupted by the influence of ſome paſſions, eſpecially grief and joy; and it flows down the cheeks in form of tears: it is remarkable that horſes, deer, and dogs, alſo ſhed tears.

It would be impoſſible, conſiſtently with the nature of my plan, to enter on a ſcientific conſideration of viſion; to explain which, the theory of optics, a very curious and complicated branch of philoſophy, muſt previouſly be underſtood.

I ſhall only remark, therefore, that the rays of light reflected from objects of viſion, paſſing through the pupil, and refracted by the humours of different degrees of denſity,

fall upon the *retina*, a very ſenſible membrane at the bottom of the eye, where the image of the object is painted, though in an inverted poſition; and by the impreſſion made on the nerves of this membrane, it is conveyed through the brain to the mind, which forms a correſponding idea of its colour, dimenſions, diſtance, &c. *Light*, therefore, is the natural ſtimulus of the eye. When it falls on the eye in too great a volume, the pupil, ſtimulated too forcibly by its vivid rays, contracts, and excludes a portion of them, as happens always when we paſs ſuddenly from a weak to a ſtrong light; and, on the contrary, the pupil expands in a weak light, that it may admit as many rays as poſſible.

Though light reſemble fire in ſome of its properties, there are ſome circumſtances in which they are different.

The velocity of light is amazingly great; as its rays, iſſuing from the ſun, paſs through a ſpace of above ninety-five millions of miles to our earth in eight minutes and thirteen ſeconds.

It was reſerved for the genius of the immortal *Sir Iſaac Newton* to diſcover that the

rays

rays of light are each diviſible into ſeven fundamental colours, and that thoſe colours are not, as is vulgarly ſuppoſed, inherent in the objects; but that the different colours of bodies proceed entirely from their texture, which diſpoſes them to refract one colour of the rays rather than another.

It is a ſingular circumſtance, but confirmed by experiments, that white is formed by an union of the ſeven fundamental colours; and as the rays of light are white, ſo they are diviſible into the different colours of which they are compoſed, by means of a priſm. The judgment we form of the qualities and diſtances of the objects of viſion would be very erroneous, were it not corrected by experience; hence the deceptions of infants, and the aſtoniſhment of a young gentleman, who, being born blind, recovered his ſight by couching; and found himſelf deceived with reſpect to thoſe things which he ſaw, and which he had formerly known by the touch only.

The eyes of ſome perſons are ſaid to have emitted ſuch luminous ſplendour in the dark, as to render objects viſible to them. This has been related of *Caius Marius*, the

Emperours *Auguſtus* and *Tiberius*, and others; and the celebrated *Julius Scaliger*, and *Theodore Beza*, have aſſerted, that they could by this means read books in darkened room.

New-born infants are blind for ſome time after birth, and this alſo is the caſe with ſome other animals: a wiſe proviſion of nature againſt the injury which ſo delicate an organ would ſuſtain by a ſudden glare of light.

There are ſeveral natural defects of viſion. In perſons who are ſhort-ſighted, the globe of the eye is more oval than ordinary, and therefore the diſtance between the pupil and the retina is too great, and the images of the objects are not ſufficiently diſtinct. Such perſons are in ſome meaſure benefited by concave glaſſes. Others, on the contrary, ſee diſtant objects well, but not thoſe which are near and ſmall: this defect happens moſt frequently in old age, and is remedied in ſome degree by the uſe of convex glaſſes.

Some perſons cannot ſee in a weak light; this is called night-blindneſs, and is owing to the nerves of the retina not being ſufficiently ſenſible: a contrary defect proceeds from ſuch extreme delicacy of the nerves of the eye, that they are too forcibly ſtimulated by the rays of light.

§. 17. The *Ear* is a curious and complicated organ. It conſiſts of the external ear, which reſembles a ſegment of a circle; a winding paſſage leading to the drum, which is a membrane ſtretched acroſs the paſſage: ſome very ſmall bones annexed to the back of this membrane by muſcles; and a cavity beyond theſe, lined with a membrane, ſupplied with a conſiderable nerve which renders it very ſenſible: this cavity terminates in a tube which opens into the back part of the mouth.

The external ear is ſupplied with muſcles; and which in ſome animals is moved by them in various directions, for the more ready admiſſion of ſounds. Some men have had the faculty of moving the external ear, and their hearing has been more acute on that account; the preſſure of the ears during infancy prevents us from enjoying that advantage. It has been ſuppoſed by ſome that there is a communication between the external ear and the paſſage or tube which opens into the mouth, from ſome perſons being able to breathe through the ear, and even force the ſmoke of tobacco through it; but in theſe caſes there was ſuppoſed to be a preternatural opening in the drum.

The drum is covered with a mucus in infants, which breaks the force of ſounds; and which, if too acute, would exceedingly diſorder their very irritable nerves, and throw them into convulſions.

Sound is the natural ſtimulus of the ear. Its rays are collected and concentrated by the external ear, paſs through the tube, ſtrike more or leſs forcibly on the tympanum or drum; which, being elaſtic, vibrates, and produces an undulation of the air contained in the inner cavity, by the impulſes of which on the nerves of its lining membrane, correſponding impreſſions are conveyed to the mind.

Sound is a tremulous motion impreſſed upon the air, which agitates the minuteſt particles of the bodies it acts upon. Bodies are more or leſs ſonorous, according to the degree of their elaſticity; hence muſical inſtruments and ſtrings are always conſtructed of elaſtic materials; hence we can account why ſome perſons break wine-glaſſes by the voice.

Sound moves with the celerity of 1200 feet in a ſecond. It is communicated through water, and more ſolid ſubſtances; for

for the Abbe *Nollet* heard a perſon ſpeak when he was 18 feet under water; and a perſon at Halle, by putting his ear to the ground, heard the noiſe of the cannon fired at the battle of Raſbach, though many miles diſtant. From the communication of the ear with the mouth, we can account why deaf perſons can hear when a ſlip of board is placed with one end on a muſical inſtrument, and the other between the teeth; and we are aſſured that a deaf perſon *heard* what was written on her back or arm.[a]

It has been alledged that the progreſs of ſound is not retarded by the ſtrongeſt wind blowing in an oppoſite direction, but this may be doubted; it ſhould ſeem, however, that it is affected by the rarity, denſity, and elaſticity of the atmoſphere: hence ſounds are ſtronger in ſummer than winter, in hot than cold air, and when the ſounds are directed againſt a wall. *Echo* proceeds from the reverberation of ſound. A bell does not emit any ſound in an exhauſted receiver.

[a] "Quæ ſcribebantur ſuper brachium dorſumve ſurdæ virginis, ea recte *audiebat*."

Halleri Element. Phyſiolog. vol. v. p. 254.

Much

Much has been attributed to the influence of ancient muſick on the paſſions; and even in more modern times, inſtances are recorded of its power over the mind. *Amurath* the IVth, Emperour of the Turks, a cruel and unrelenting tyrant, having condemned ſeveral of his brothers to death, was ſo affected by the muſick of the harp, as not only to pardon them, but even to ſhed tears of compunction. The cure of the bite of the tarantula is fabulous only with reſpect to the cauſe of the diſeaſe, which is a ſpecies of melancholy.

It has been aſked how it happens, that as we ſee with two eyes, and hear with two ears, we only ſee objects, and hear ſounds ſingly. The moſt eaſy ſolution of the queſtion is, that the mind does not diſtinguiſh impreſſions made on it through the external ſenſes, when they are very ſimilar; and that cuſtom and experience may contribute to regulate the judgment in this reſpect.

The ſenſe of hearing is exceedingly and painfully acute in ſome perſons. A celebrated Profeſſor was much diſtreſſed even by the gentleſt ſounds, and ſuch as were not audible by others: In diſeaſes, as nervous fevers,

fevers, phrenzy, hydrophobœia, locked jaw, and the hyſteric diſeaſe, &c. the ſenſe of hearing is often intolerably acute.

Some ſounds are univerſally grating to every ear, as the raſping of a file; ſome perſons are peculiarly diſturbed by particular ſounds, owing to a depraved ſtate of the auditory nerves; and indeed to depravity of one or other of the external ſenſes in diſeaſes, we may attribute many extraordinary and untoward ſymptoms.

§. 18. The *Noſtrils* are the organs of ſmell, and *Odours* are their natural ſtimuli. The cavity of the noſtrils is lined with a very ſenſible membrane amply ſupplied with nerves, which being ſtimulated by odorous effluvia, convey the impreſſion to the mind.

There are few bodies in nature that have not a peculiar odour; even gold, in a ſtate of ſolution, has a muſky ſmell. The ſubtilty of odours is almoſt inconceivable. One grain of ambergriſe ſcented many volumes, and the ſmell was not much diminiſhed after forty years. Odours are extended to a great diſtance; a dog traced and followed his maſter an hundred leagues from Paris, directed by the

the peculiar ſmell of his perſpiration; and after the battle of Pharſalia, the vultures were allured from a great diſtance by the putrid effluvia of the dead bodies. The effluvia of purging medicines ſometimes purge; and ſtrong odours have been fatal, by diſcharging a great quantity of phlogiſticated air: hence the danger of keeping flowers and fruits in cloſe rooms. We know that certain effluvia are ſtimulating to a conſiderable degree; hence the uſe of volatile ſalts in faintings. Effluvia may in ſome caſes be nutritive. *Democritus* is ſaid to have kept his ſiſter alive three days by the ſmell of new bread.

From ſome peculiarity in the ſtate of the olfactory nerves, or from habit, ſome perſons, and even nations, are gratified by particular flavours, which are generally diſguſting. The inhabitants of Greenland are fond of train oil, and the moſt rancid fat: the moſt putrid meats are not offenſive to particular perſons: the ancient Romans held the *garum*, prepared of the putrid livers of fiſhes, to be an extraordinary delicacy.

Brutes ſelect their foods rather by the ſmell than the taſte, and yet they are ſometimes deceived by this teſt.

§. 19. The

§ 19. The *Organs* of *Taſte* are the tongue and palate. The *tongue* is ſupplied with conſiderable nerves, the ends of which form little prominences or papillæ on the ſurface of the tongue, eſpecially at the tip and ſides.

The natural ſtimuli of the organs of taſte are all *ſapid* bodies, ſo called in oppoſition to ſuch as are inſipid or taſteleſs. Sapid bodies do not affect the tongue except in a liquid ſtate. Though this organ is very irritable, yet jugglers leſſen its ſenſibility ſo much by a ſolution of alum, which is a powerful ſedative, as to be enabled to lick red-hot iron, and hold burning coals in their mouths.

The ſenſe of taſte is ſuppoſed to be uſeful in diſtinguiſhing wholeſome from noxious foods; but this is not always the caſe; for the agreeable taſte of the Manchionille apple has induced ſtrangers to eat this poiſonous fruit; ſeamen have been poiſoned by eating a fruit reſembling the nutmeg; and animals endued with an exquiſite ſenſe of ſmelling and taſte, have been poiſoned by noxious plants.

There is an intimate connection between ſmell and taſte; ſo that what is grateful to the former, is ſeldom diſguſting to the latter.

Things

Things grateful to the ſmell are not however always ſo to the taſte; and indeed many things which are highly odorous, have ſcarcely any taſte, and the reverſe. Sometimes the ſmell is very grateful, when the taſte is very diſguſting, and the contrary. What was remarked concerning depravity of the ſenſe of ſmelling may be applied to taſte: ſome natives of India cannot reliſh eggs unleſs they are rotten; the Eſquimaux prefer putrid fiſh to thoſe that are ſound. The longings for chalk, coals, &c. are effects of diſeaſe.

§ 20. *Touch*, ſtrictly ſpeaking, is confined to the ends of the fingers; the nerves of which are, like thoſe of the tongue, collected into little prominences, for the purpoſe of more acute feeling. It has been poſitively aſſerted, that blind perſons can diſtinguiſh colours by the touch; and that a blind woman could know when they were mixed.

The whole ſurface of the body being covered by the true ſkin, which is very ſenſible, its ſenſation, though not ſo accurate as that of the ends of the fingers, is ſufficiently ſo to warn us of the noxious impreſſions of heat,

heat, cold, &c. When the heat of the bodies we touch is greater than the temperature of the human body, which is about 96 degrees, they excite the ſenſation of heat; if below that degree, the ſenſation of cold.

The true ſkin would be intolerably irritable, were it not covered by an inſenſible ſcaly ſubſtance called the *ſcarf* ſkin. The ſurface of the body is alſo defended in ſome parts by the nails and hair, which are deſtitute of ſenſibility.

The ſcarf ſkin not only covers the true ſkin on the ſurface of the body, but alſo the continuation of it, which lines all the cavities of the body, and forms what is called the villous or inner coat of the ſtomach and inteſtines; and becomes in ſome degree a defence to the nerves of the true ſkin againſt the acrimony of foods, drinks, &c.

It is very thick and hard on the ſoles of the feet, and palms of the hands of laborious perſons; inſomuch as to enable them to handle, or walk upon burning coals, or red-hot metals.

It is a layer of the ſcarf ſkin, called the *reticular* membrane, which produces difference of colour in different nations. Some have

have aſſerted that this difference is the reſult of climate alone; but no inſtance can be produced of an European in a hot climate becoming black, or a negro becoming white in a cold or temperate climate: the diſtinction is original, and impreſſed by the hand of nature. Sometimes the child of black parents has been born of a white colour; but this is a mere error of nature.

The nails are a continuation of the ſcarf ſkin condenſed; they grow after death, and in the embalmed body of a young lady who died above 250 years ago, they are cut every year.

The difference of the colour of hair ſeems to be owing partly to climate; in the original natives of hot countries it is black, and in the Africans wooly and curled.

The ſenſe of feeling is very exquiſite in ſome perſons. The celebrated Queen of France, *Ann of Auſtria*, could not ſleep in the fineſt linen ſheets, which to her feeling were coarſe and rough; and therefore was obliged to uſe ſheets of cambrick. The ſenſe of feeling is ſometimes depraved. Some perſons cannot bear the touch of velvet, others of the downy peach; and I knew a captain

of

of a ſhip of war to whom the touch of hair was intolerable.

The eaſtern nations conſider the means of exciting pleaſurable ſenſations as an article of *luxurious* indulgence. Beſides the pleaſure of *champowing*, well known to our Britiſh nabobs, the Chineſe excite a very pleaſureable ſenſation by tickling the ear with a fine hair pencil.

The ſenſe of touch is ſuppoſed to be the leaſt fallible, and corrects the errors of ſight.

There is an internal ſenſe of feeling which has ſome relation to the external ſenſe of touch; but which is more diverſified; inſomuch that every organ ſeems to have a ſenſation peculiar to itſelf. The internal ſenſations are however very indiſtinct; and hence we are often liable to be miſtaken with reſpect to the real ſeat of diſeaſes, if we do not attend carefully to the influence of ſympathy, either general, or that which is eſtabliſhed between one organ and another; as between the head and the ſtomach, the ſtomach and the heart, and of the lungs, kidneys, and inteſtines with the ſtomach.

Though diſagreeable or painful ſenſations may be excited in the other organs of ſenſe,

as

as well as that of touch; yet they more peculiarly belong to this ſenſe; and though, ſtrictly ſpeaking, it is confined to the ends of the fingers; yet, in the more general acceptation, it is applicable to the ſenſe of feeling, which is very extenſive.

There is, as I remarked before, but a very thin partition between a pleaſant and a painful ſenſation, and in many reſpects they are rather relative than poſitive: thus a degree of ſtimulus which would give pleaſure to a man of callous nerves, would produce painful ſenſation in a more delicate perſon.

It may be truly ſaid that even in health, we are rarely free from diſagreeable feelings; though from their frequency, and being but comparatively ſlight, the mind is not always conſcious of them: thus we often change our poſture inconſciouſly, from a ſenſation of uneaſineſs.

§. 21. It is ordained by the Author of our nature, that all noxious impreſſions made on our bodies ſhould be accompanied with a diſagreeable or painful ſenſation, which might warn us of our danger, and rouze us to a ſenſe of the neceſſity of uſing adequate means for our relief.

Thus

Thus inflammation of an organ is accompanied with pain, by which we are excited to prevent a fatal mortification; in which ſenſation is deſtroyed. Hence it is that even our ſufferings become the means of our ſafety.

§. 22. When we conſider the very complicated ſtructure of ſome of the organs of ſenſe, eſpecially of the eye and ear, and the intimate connexion of the others, not only with each other, but with other organs, we can eaſily account why their affections and diſeaſes are exceedingly numerous. Beſide thoſe which they are ſubject to in common with the ſimple ſolids, (§. 4.) there are others which reſult from the nature of their ſeveral functions, and which may be briefly referred to exceſs, defect, or irregularity of each ſenſe; and which beſides the general cauſes, are often connected with various faults of circulation, ſecretion, and excretion, to be enumerated hereafter. Many perverſions of the ſenſes proceed, not ſo much from any fault in their proper organs, as from thoſe of others: ſuch are, various and extraordinary deceptions of viſion and hearing from diſeaſes of the head and ſtomach; and morbid

affections of the taſte and ſmell from the ſame ſources: but above all, thoſe of the external and internal ſenſe of feeling are ſo numerous and extenſive, that there is not a diſagreeable, painful, or diſtreſſing ſenſation, which may not be derived from exceſs or depravity of this ſenſe; whilſt a defect, or total deprivation, of it is connected with many of the moſt inveterate and fatal diſeaſes.

From what has been ſaid on the animal functions, the nervous ſyſtem may be aptly compared to the ſun in our planetary world; as it ſheds its influence to the remoteſt receſſes of the body, diffuſes the living principle to every particle of the ſenſible and moving organs, and animates and invigorates the whole machine.

Before I diſmiſs this branch of phyſiology, it may not be improper to remark, that as exquiſite ſenſibility of body and mind (for they are generally concomitant) is the chief ſource of our greateſt pleaſures, it is no leſs ſo of our moſt poignant ſufferings; and it is worthy of obſervation, that the organs are not all equally affected by the ſame ſtimuli: A glare of light does not offend the ear, nor ſtrong ſounds the eye: a ſolution of emetic tartar

tartar will not affect the eye, though in the ſtomach it creates ſevere nauſea; and air and blood, which are natural ſtimuli to the lungs and heart, are offenſive to the ſtomach.

§. 23. *Sleep.* All animals, even fiſhes, are ſuppoſed to ſpend part of their time in ſleep.

It is probable that they ſleep conſtantly, or with little interruption, before birth: we know that infants are rarely awake for ſome months after birth.

Animals, beaſts of prey excepted, generally ſleep from ſun to ſun, and ſeveral ſleep through the winter.

The laborious part of mankind enjoy the genuine luxury of ſound ſleep, whilſt the ſtudious, and faſhionably diſſipated, *murder* ſleep, by inverting the order of nature.

Old perſons, like infants, require more ſleep than the young and middle-aged; who, whilſt in health, ought not to ſleep more than eight hours in twenty-four.

We ſhould ſoon be exhauſted by the conſtant exerciſe of our bodily and mental functions, were we not relieved by ſleep. During ſleep, the vital and natural functions are performed more ſlowly and regularly

than when we are awake; the faculties of the mind are in a great degree ſuſpended, and the muſcles of voluntary motion are at reſt. Hence, after a ſound ſleep, we awake alert and vigorous.

Exceſs and defect of ſleep are very injurious both to body and mind: Want of ſleep is a very frequent concomitant of diſeaſes; and there are many inſtances of perſons ſleeping for weeks and months; and one perſon ſlept four years with very little interruption.

Some perſons, whilſt in a ſound ſleep, get out of bed, dreſs themſelves, light a fire, write, undreſs themſelves; go into a bath, &c.; and ſome years ago a young gentleman happily acquired a valuable wife, by a beautiful young lady of large fortune having, in one of her *ſomnambulous* peregrinations, gone into the bed in which he, as a gueſt, lay; the room being ſuppoſed to be haunted, from the young lady's having long been in the habit of removing from her own bed to this: May we not charitably ſuppoſe, therefore, that many of the occaſional deviations of the ladies, both ſingle and married, by which they miſtake one bed for another, are ſolely to be attributed to an unlucky propenſity

ſity to walk in their ſleep? I flatter myſelf, at leaſt, that due credit will be given me for the *ingenuity* of my apology for female frailty.

Want of ſleep is a moſt diſtreſſing, weakening, and dangerous ſymptom, in a multiplicity of diſeaſes. The cauſes of morbid irritation, which produce and ſupport this dreadful evil, are many and complicated; and it is of the utmoſt conſequence that the true cauſe ſhould be well aſcertained, and that it may be ſafely and ſpeedily removed. In no inſtance do ignorant practitioners err ſo much, and ſo frequently, as in caſes of this kind. The timid are deterred from uſing the neceſſary means; and therefore loſe many patients, which the man of ſkill would have ſaved; whilſt, on the other hand, the raſh and preſumptuous deſtroy many by improper means.

The importance of the remark muſt be my apology for its being out of its proper place; for no circumſtance, in the whole extent of medical ſcience, evinces more ſtrongly the danger of a ſuperficial and imperfect knowledge of the nature and cauſes of diſeaſes.

CHAP.

CHAP. II.

The Natural Hiſtory of the HUMAN MIND.

The Internal Senſes—Perception—Ideas of Senſation—Of Reflection—Attention—Memory—Morbid Affections of Memory—Succeſſion of Ideas—Notions—Aſſociation of Ideas—Imagination——Reminiſcence—Thought—Judgment—Reaſoning—Genius, or Invention—Truth—Error—Morbid Affections of the Mind reſpecting Truth and Error—Delirium—Madneſs—Melancholy—Hypochondriaciſm—Idiotiſm—Pleaſure and Pain—Appetites—Depraved Will—Voluntary and Involuntary Motions—-Nature——Paſſions—their morbid effects—Imaginary Diſeaſes—Important Remark.

§. 24. FROM the connexion between mind and body, the internal ſenſes are objects of phyſiology, and they properly come under our conſideration, after the external ſenſes. I ſhall therefore here preſent the reader with a ſuperficial, yet intereſting, ſketch of our mental faculties.

It is ſurpriſing that, whilſt the mind of man is ſo anxiouſly employed in inveſtigating the

the nature of external objects, it ſhould not be more ſolicitous to underſtand its own faculties and powers; and that we ſhould be more deficient in this branch of knowledge than in any other.

The metaphyſical diſquiſitions of philoſophers would certainly be very much aſſiſted by a more frequent diſſection of perſons who die mad; idiots; or thoſe who were remarkable for failure of memory.

§. 25. *Perception* is an impreſſion conveyed from the external ſenſes to the brain, by means of a certain change or motion on an external ſenſe.

§. 26. *Idea* is a conſciouſneſs or recognition of the motion excited in the brain by a particular object, and imparted to the mind, in a manner which we cannot account for.

Some have imagined, that the picture of an object painted on the retina is alſo painted on the brain, and is thus perceived by the mind; but it is now more generally believed, that all external impreſſions made on the nerves of the organs of ſenſe, excite perception in the mind, by merely producing a corre-

correſponding motion or change in the brain; ſo that an idea is only the ſign of the impreſſion, and not the impreſſion itſelf.

Ideas are either *ſimple*, as thoſe which are excited by our ſeeing one colour only; or compound, as when I view a man, I conceive the complex idea of his head, limbs, colour of his clothes, &c.

Ideas may alſo be divided into thoſe of *ſenſation*, being impreſſions made through our five ſenſes; and thoſe of *reflexion*, being ſuch ideas of ſenſation as preſent themſelves to the imagination, or are recalled by the memory; as when I perceive *in the mind's-eye* the *perſon* of an abſent friend, or recollect when and where I ſaw him laſt.

Mr. Locke aſſerts, contrary to ſome foreign philoſophers, that we have no innate ideas; but that the mind of a new born infant is a mere blank; and that our ideas are formed from impreſſions received through the eye, ear, &c. I have already remarked, that ideas of reflexion are derived from thoſe of ſenſation. Our ſenſes do not impreſs the brain with the ſame perception of the ſame object; and it is only by experience that the mind forms a true idea of its qualities: An infant,

or a perſon born blind, who had been reſtored to ſight, when they view a portrait for the firſt time, will conceive that it projects from the canvas, until by the feel they find it does not.

The celebrated *Mr. Boyle* tells us, that a man who was born blind, and conſequently could have no juſt idea of colour, being told that ſcarlet was a vivid and ſplendid colour, expreſſed his idea of it, by reſembling it to the ſound of a trumpet: Thus a deficiency of one ſenſe rendered the idea imperfect and abſurd.

It is therefore reaſonable to ſuppoſe, that if we had been endowed with other ſenſes than thoſe we have at preſent, our perceptions and ideas would have been very different; for there is no abſolute neceſſity in the nature of things, that we ſhould not perceive or know things otherwiſe than we do at preſent; or, having other ſenſes ſuperadded to the preſent, we ſhould not perceive the magnetic, electric, or aerial fluids, as clearly as we now do water and fire. So on the other hand, light and colours are to the blind, and ſounds are to the deaf, as if they did not exiſt; becauſe they are incapable of receiving any ideas from them.

In

In contemplating the objects and circumſtances of perception, we are to conſider them in a certain order.

1ſt, The external object, with its genuine attributes: *e. g.* a tree.

2dly, Their impreſſions on the organs of ſenſe; the picture of a tree, painted on the retina, at the bottom of the eye.

3dly, The corporeal effect of thoſe impreſſions conveyed to the brain: as when the image of the tree makes a correſponding motion on the brain.

4thly, The repreſentation or idea of this motion conveyed to the mind.

It is probable, as the celebrated author[b] of *Alciphron* remarks, that theſe circumſtances are arbitrary, not neceſſary; for that the Supreme Being might, for example, have ordained that *ſcarlet* ſhould have been otherwiſe painted on the retina; and conſequently, that it ſhould make a different impreſſion on the brain, and excite a different idea in the mind.

Though we perceive only the *ſigns* of things, and not the things themſelves, we cannot be led into error, provided ſimilar perceptions are excited in the minds of all men by the ſame cauſes: which would not be the caſe,

[b] Dr. Berkley, biſhop of Cloyne.

caſe, if the mind conceived, by means of the ſight, that a portrait is a convex, ſolid body; whereas the touch determines it to be a plane.

The mind does not perceive all impreſſions, but only thoſe which are either ſtrong, or are leaſt familiar to us, and conſequently moſt ſtriking. Thus, though reſpiration or breathing, is an act of the will, yet we do not, in general, attend to it; becauſe the mind is habituated to it, though we have the power of perceiving it when we pleaſe. Hence it is, that the attention of the mind being leſs engaged by ſlight impreſſions, it is left more at liberty to perceive thoſe which are more important.

§. 27. *Attention* is that effort of the mind by which it applies itſelf intenſely to the contemplation of an impreſſion, ſo long as the repreſentation of it continues, excluding all others. The attention is more ſtrongly engaged by objects of ſight, than thoſe of the other ſenſes; and therefore they make the ſtrongeſt impreſſions on the imagination.

§. 28. *Memory* is that faculty of the mind by which we retain the ideas of impreſſion after the object is removed.

Thoſe

Thoſe things are always retained longeſt and moſt forcibly, which moſt ſtrongly engage the attention. It is more than probable that the brain, and not the mind is the ſeat of memory; and that ſtrong impreſſions are, as it were, deeply and indelibly engraved on the ſubſtance of the brain; whilſt thoſe that are ſlight, leave no impreſſion at all.

The memory is ſtrongeſt between the 8th and 50th years of life; after that period the brain becoming more firm in its texture, it does not retain recent impreſſions ſo ſtrongly as thoſe which have been long ſtored up in the mind. It is perhaps for this reaſon, that aged perſons are fond of recapitulating circumſtances which occurred in the earlier periods of life.

The inſtances of the ſtrength of memory are almoſt incredible. A very near relation of mine could, when a boy, repeat verbatim, one of Archbiſhip *Tillotſon's* ſermons after one reading. The celebrated *Scaliger* committed to memory the works of *Homer* in twenty-one days; and the other Greek poets in four months. *Muller of Leipſick* acquired, and perfectly retained twenty different languages; and the famous *Magliabecchi* retained moſt

moſt exactly, the contents of any manuſcript after one peruſal.

There are many wonderful circumſtances reſpecting the retentive faculty, which are inexplicable.

The mind has a power of recalling the traces of former impreſſions, provided they are entire and ſufficiently ſtrong; and, in this caſe, the mind is conſcious that it has recalled them from the memory; but if they are weak, they recur without any remembrance of their ſource.

Sometimes ideas obtrude themſelves ſpontaneouſly, repeatedly, and painfully, upon the mind; nor can it diſmiſs them at will. This is one great ſource of human miſery; and as reaſon has very little power to counteract thoſe painful impreſſions, the attention ought to be diverted by other ſtrong and more agreeable impreſſions: Hence the benefit of change of place, amuſements, and ſometimes intereſting occupations of the mind, to thoſe who are depreſſed by grief, or labour under ſuch corporeal maladies as excite painful ſenſations in the mind; and much relief has been obtained by oppoſing a paſſion of a contrary nature to that which predominates.

An

An early habit of arrangement improves the memory. The late celebrated Baron *Haller*, who was a prodigy of learning, tells us, that it was his practice from early youth to commit what he read to paper, by claſſes, orders, &c.

Some of the human race have been found deſtitute of memory. Thus Madame *Le Blanc*, the wild girl found in France, and a Poliſh boy caught in the woods, after they were taught to ſpeak, could give no account of their former life; becauſe, having been deſtitute of the uſe of ſpeech, the mind could not be impreſſed with any notions that could aſſiſt the memory; the artificial or arbitrary ſigns being too few for the purpoſe.

The memory is improved or weakened by our mode of life: It is improved by a regimen of vegetables and water, as I have myſelf experienced; and it is weakened by a ſtimulating diet. A perſon had an amazing memory until he was thirty; he then began to drink wine, and his memory failed him exceedingly.

Diſeaſes, thoſe of the head eſpecially, often impair or totally deſtroy the memory. A perſon, after a violent fever, could not re-

collect

collect the letters of the alphabet, or even his own name. Sometimes the ſtrongeſt and moſt agreeable ideas are retained, whilſt the reſt are loſt: A muſician, after a fit of illneſs, retained his muſical ideas, but forgot every thing elſe. We are told by *Thucydides*, that during the prevalence of the plague in Attica, ſeveral of thoſe who recovered were found to have loſt their memory. Violent head-aches, apoplexy, expoſure to violent heats, and a variety of other cauſes, have injured the memory; which, on the cauſes being removed, has been reſtored. Even in health ſome perſons have alternately loſt and recovered their memory, at certain intervals, without any aſſignable cauſe. Sometimes from diſeaſe; thus a perſon, who by a blow on the head was entirely deprived of his memory; when his health was reſtored, recovered the recollection of circumſtances which had occurred many years before; but none of recent tranſactions.

On diſſecting a man who had loſt his memory, the brain was found to be dry, hard, and even friable; and that part of it from whence the nerves proceeded, was dry and ſhrunk.

Some

Some very old perſons are not only deſtitute of memory, but of deſire or appetite, even for food. The great *Duke of Marlborough*, and the celebrated *Dean Swift*, are ſaid to have been mere *ſtrulbugs* ſome time before they died:—Such is the lot of exalted talents, and ſuperior genius?

Ideas ſeem to thruſt out each other when the memory is, as it were, overloaded; as happens to men who read on a variety of ſubjects in quick ſucceſſion.

§. 27. *Succeſſion of Ideas.* It has already been remarked, that many impreſſions are ſo ſlight as ſcarcely to leave any traces on the memory: it is by the ſucceſſion of ideas that we eſtimate time and duration; hence it is that time ſeems to move rapidly or ſlowly according to the nature of our preſent ideas.

The immortal *Shakeſpeare*, who, though no ſpeculative metaphyſician, had nevertheleſs a moſt intimate, and as it were, intuitive knowledge of the human mind, has admirably repreſented thoſe circumſtances which influence the ſucceſſion of our ideas:[a] and it very much imports *man, whoſe days*

[a] As You Like it.

are

are few and full of evil; that, as he has, in ſome degree, the power of ſelecting his ideas, he ſhould not be ſo totally engroſſed by thoſe ideas of ſenſation, which, though commonly deemed pleaſurable, are generally unprofitable, as not to call up and arreſt thoſe reflex ideas which may afford rational and permanent employment to the mind.

§. 30. *Notions* are thoſe ideas which are formed by *abſtraction*, which is that effort of the mind by which we ſeparate a part from the whole; as the quality of blackneſs, when I think of a negroe, independent of the circumſtances of form, character, &c. in which he is not different from other men. Mankind, in the various ſtages of ſocial improvement, have invented manifold ſigns or means of expreſſing their abſtract ideas, as words, writing, hieroglyphics, printing, &c. The human mind, in its preſent ſtate of exiſtence, is ſo connected with, and clogged by, the body, that we are ſcarcely if at all able to abſtract the idea of quality from that of matter. Thus, if I attempt to form the abſtract notion of whiteneſs, ſtrength, &c. I cannot ſeparate them from one or other of thoſe things

with which I have found them connected, as a white wall, a black dog, a ſtrong horſe, &c. Nor can we even abſtract moral qualities entirely and preciſely from matter; hence it is that the all-wiſe, good, powerful, and *immaterial* Author of the univerſe has been repreſented by ſuperſtition under a corporeal form; and from this defect of the mind image-worſhip took its riſe.

§. 31. *Aſſociation* is that faculty by which ideas are connected which have no intimate relation: thus when I think of a perſon, his place of abode, family, friends, &c. are apt to recur to my memory.

§. 32. *Imagination* is ſo far different from memory, that the latter only recalls the ſigns, whereas imagination recalls the ſenſations themſelves; and the impreſſions on the mind are conſequently much more vivid and ſtrong.

Theſe faculties of the mind therefore are diſtinct. Some men have ſtrong memories, but weak imaginations; in others the imagination is ſtrong, but the memory weak; and

and they are not often united in the ſame perſon. Memory may make a man learned, but imagination makes the poet. Imagination may repreſent ſenſations ſo ſtrongly, as that they cannot be diſtinguiſhed from the firſt and immediate impreſſions; thus, after hearing the ſound of a bell for ſome time, the ſound ſeems ſtill to remain upon the ear after it has ceaſed.

If the traces of a ſenſation are very ſtrong, they are often equal to a new and preſent ſenſation: hence *viſions* often ſuggeſted by ſuperſtitious fears, or enthuſiaſtic preſumption; hence the ſtrong impreſſions made by dreams, delirium in fever, and the falſe ideas of melancholy and mad perſons, and which no reaſoning can perſuade them that they are not real.

§. 33. *Reminiſcence* is by ſome philoſophers diſtinguiſhed from memory.

It is truly wonderful that the mind has a power of ſelecting and arranging ideas according to their ſimilarity; and in this reſpect may be compared to a library, in which books on the ſame ſubject are placed together. I have already taken notice of the power of aſſociation, of which reminiſcence is a part.

By a kind of claſſification, new ſenſations, and their ſigns, are, without any effort of the mind, placed next to thoſe of a ſimilar kind. The mind is led as by a clue from one thing to that with which it is connected. If I have forgotten the name of a certain tree, the general term *tree*, which is the claſs, preſents itſelf; I afterwards run over in my mind the names of the fir, birch, walnut, &c. but all theſe I reject, until I recollect the *oak*, the name of which I had forgot, but now recognize by its affinity with certain qualities of that tree reſiding in the memory, though one of the abſtract arbitrary ſigns, the name, did not then occur to me.

This faculty of the mind, and the advantages we daily experience from order and method, pointed out to philoſophers what is called ſcientific arrangement. Thus the mathematician riſes gradually from the moſt ſimple to the moſt abſtruſe and complicated propoſitions, each being intimately connected with that which precedes and that which follows; the naturaliſt divides his multifarious ſubjects into certain claſſes, orders, genera, and ſpecies. In this manner the celebrated *Linnæus* has made his arrangement.

Phyſicians

Phyſicians alſo, after the example of naturaliſts, have lately adopted a ſimilar plan, of which an illuſtration is given in another Eſſay,[a] it will be ſufficient to remark for the preſent, that, by thus methodizing our ideas, we avoid confuſion and perplexity, and exceedingly aſſiſt the memory; for as moſt of our ideas are complex, it contributes very much to the advancement of knowledge, that the mind ſhould be able to recall the whole ſyſtem of congenial ideas and notions by one arbitrary ſign. Thus, when we mention a circle, the definition, diameter, radius, &c. recur to the mind.

Ideas recur in the ſame order in which they they firſt entered the mind; thus if we talk of a juſt and pious prince, *Antoninus* and *Marcus Aurelius* occur to the memory.

§. 34. *Thought* is that faculty of the mind by which we attend to a ſeries of ideas in the ſame ſucceſſion in which they occur.

Des Cartes defined thought to be the eſſence of mind, intimating that the mind always thinks: this has been diſputed by the materialiſts, who, were they to admit the

[a] On the difficulties of ſtudying Medicine, &c.

poſition, muſt allow the immateriality of the ſoul. Both parties have appealed to phœnomena both in the ſound and diſeaſed ſtate of the body; and, as always happens in theſe conteſts, each accommodate their concluſions to their premiſes. But we ought not to deny that the ſoul thinks during ſleep, or whilſt a perſon is delirious, or in a ſwoon, merely becauſe the mind retains no conſciouſneſs of the impreſſion; for we know that perſons who walk in their ſleep do many things which imply conſciouſneſs in the inſtant, yet have no recollection of what they did in that ſtate.

Attention is the ſource of thought and the mother of ſcience; and memory is its repoſitory. Without attention, we could never connect two ſucceſſive ideas, as the ſecond would always obliterate the firſt; and it would therefore be totally impoſſible to attain knowledge.

Men complain of the ſhortneſs of life; and yet by not making a choice of proper objects of thought, or neglecting to fix the attention ſufficiently, many of our hours and days paſs away like a ſhadow, and leave no more traces behind than if they had not exiſted.

Thoſe perſons who have the direction of young people, ought therefore to give them an early habit of attention, and logical accuracy, in diſcuſſing not only ſubjects of literature and ſcience, but every other; by this means they will not only afford them manifold advantages in their common intercourſe with the world, but give them a reliſh for ſuch ſubjects of enquiry as may at all times enable them to fill up their time in the moſt uſeful and agreeable manner.

What is the great ſource of idleneſs and diſſipation?

It is owing to our not being accuſtomed to think; ſo that every effort to that purpoſe being painful, we decline the taſk, and turn aſide to thoſe objects of ſenſation, which, being at leaſt frivolous, enfeeble the mind, and pervert the judgment.

It is probable that all men are not born with the ſame degree of intellectual power; yet the difference is not ſo great as is commonly imagined.

§. 35. *Judgment* is that act of the mind by which we compare our ideas, to determine how far they are ſimilar or different. With reſpect

reſpect to thoſe ideas which ariſe from ſenſation, they are generally ſo ſimple, that it requires very little effort of the mind to form the compariſon; as between colours, ſounds, and other objects of the external ſenſes.

But the objects of reflex ſenſations are generally more complex, and require a more intenſe application of the mind in analyſing and comparing their different parts. This is particularly the caſe with abſtract ideas or notions; and hence the labour and difficulty of attaining a tolerable knowledge of the different branches of the mathematics, and other ſciences connected with them.

Even in ſubjects of a leſs abſtruſe nature, we are very apt to err; as when we admit two ideas to be ſimilar, which are really different; and this often proceeds from want of due attention and patience in our examination. When we cannot attain to *certainty*, we are obliged to be content with *probability*; and, according as a propoſition approaches more or leſs to truth, the mind affords a greater or leſs degree of aſſent. This often depends on the degree of our experience. A native of a hot climate will be ſo far from conceiving it true or even probable,

probable, that water can become ſolid, that he has no idea of the poſſibility of it.

Our judgments, even concerning moral opinions and conduct, are often very different. Some nations have deemed it warrantable to expoſe their infants, when they thought it inconvenient to rear them; others leave their aged relations to ſtarve, when they become unable to provide for themſelves; and even philoſophers have not always agreed concerning the relative force of certain moral duties.

§. 26. *Reaſoning* is a ſeries of judgments: all reaſoning depends on analogy or compariſon of one idea with another. *Logic* is the foundation of all reaſoning; and our reaſoning powers are very much ſtrengthened by geometrical ſtudies: we cannot proceed a ſingle ſtep in forming our judgments without *analogy*, for we muſt compare before we can decide.

The mathematician employs analogy in the ſolution of his problems: analogy is the baſis of natural and experimental philoſophy: the moral philoſopher uſes it as a teſt of moral rectitude or depravity; it is the guide of the politician, and the rule of our conduct in common life.

In

In no inſtance, however, is analogy ſo indiſpenſibly neceſſary as in the medical art; and I am convinced that if, inſtead of vague theories, and fanciful hypotheſes, it had been employed by phyſicians with caution and preciſion, phyſic would, long before this period, have been exempted from the invidious imputation of being conjectural and precarious.

§. 37. *Genius*, or ingenuity, is ſo far different from judgment, that as the latter is employed in analyſing, comparing, and diſtinguiſhing ideas, genius conſiſts in uniting them; and the more remote they are in their nature, and the more diſtant the reſemblance, the greater the degree of ingenuity exerted in the combination.

When the great *Newton*, from the ſimple circumſtance of the fall of an apple from a tree, deduced the doctrine of gravitation as a chief law of our ſyſtem, the concluſion was very ingenious, becauſe it united ideas very remote and abſtruſe in their ſimilitude.

As judgment is ſlow, ſo genius is rapid, and often almoſt inſtantaneous in its concluſions, and is therefore more frequently connected

connected with a vivid and ardent imagination; and hence it is that the moſt ingenious men have been very deficient in judgment; and men of wit are rarely remarkable for what is called cold prudence.

Genius is of different kinds, but in what manner ſoever it may be exerted, it may be diſtinguiſhed by the term *invention*. The poet, who draws witty alluſions from new combinations of ideas, is as much an inventor, as the mechanic who contrives a machine, in which he combines certain powers which were never before united in the ſame manner.

Ingenuity, like all other faculties of the mind, is in ſome reſpects connected with, or influenced by, certain conditions of the body.

1*ſt*. With an irritable nervous ſyſtem; and therefore perſons of great corporeal ſenſibility have generally lively imaginations.

2*dly*. With a delicate ſtate of health; *Virgil*, *Paſchal*, *Pope*, and *Baratter*, were invalids.

3*dly*. It is ſuppoſed that climate has ſome ſhare, and that the middle climates, viz. between the latitudes of 30 and 45, are moſt favourable to the production of genius; and that as the *Athenians* were formerly, ſo they are, even at this period, remarkable for ingenuity;

genuity; but were not the *Bœotians*, inhabitants of the ſame climate, proverbially ſtupid, inſomuch that the celebrity of *Epaminondas* and *Plutarch*, their countrymen, could not wipe off the opprobrium?

4*thly*. Wine, and other fermented drinks, are ſaid to ſharpen the wit; and many perſons, when moderately elevated by them, evince a degree of ſprightlineſs and ingenuity, which they do not manifeſt without it; and there is reaſon to believe that *Horace* wrote ſome of his beſt odes under the cheering influence of Falernian wine.

5*thly*. Even ſome morbid affections of the body ſeem to whet the ingenuity. Baron *Haller*, who was a poet, tells us that he wrote verſes more readily when labouring under a fever; Pope *Paul* II. found his powers of eloquence increaſed by fever; and we are told that a blow on the head rendered a man remarkably ingenious, who before the accident was not ſo. Maniacal, melancholic, hypochondriacal, and hyſterical patients have often more vivacity of imagination than in health, owing to a greater degree of irritability of the nervous ſyſtem: but in all theſe inſtances, the effects ceaſe with the cauſe.

Old

Old age weakens the invention as it does the memory.

§. 38. *Truth* is a due conformity of our ideas with their objects; *Error* is the reverſe; that is, when our ideas, notions, or opinions are different from thoſe things from which they are derived.

Our external ſenſes ſometimes deceive or lead us into error; but theſe errors are rarely of any great importance, and one ſenſe may correct another.

But our greateſt and moſt eſſential errors are thoſe which ariſe from the judgment we form of the objects of reflection.

With reſpect to ſimple ideas, we can rarely err; becauſe the circumſtances which are the objects of compariſon are ſo few, that it is ſcarcely poſſible for us to draw a falſe concluſion: no perſon of a ſound mind would conclude that two and two are equal to five.

But it is in the contemplation of complex ideas that we are liable to error, becauſe we do not perceive all the parts of complex notions, and nevertheleſs argue from a *few* that we know, to the *whole*, many of which may be totally unknown.

From

From this imperfect analogy, proceed manifold errors in philoſophy, natural and moral, religion, politics, &c. Hence the fallacy of hypotheſis; when having diſcovered *ſome* circumſtances which are conformable to truth, we take it for granted, without examination, that *all* the others are ſo likewiſe.

Our errors are often voluntary, and may proceed

1*ſt*. From indolence, and an averſion to examine things with accuracy, owing to our not having been in the habit of thinking cloſely; and hence the epithet of *thoughtleſs* has been juſtly applied to thoſe, who, from not being accuſtomed to enquire and examine with care, form their concluſions from a ſuperficial view of things and opinions, and thereby conſtantly deceive themſelves. Hence the manifold and often very important errors people of all ranks and degrees fall into, with reſpect to conducting the ordinary concerns of life; for practical errors muſt generally be the conſequence of imperfect knowledge and falſe inferences.

2*dly*. Our errors may proceed from vanity and pride; for having once adopted a falſe opinion,

opinion, we are often ſo deficient in candour and good ſenſe, as to deem it detracting and diſgraceful to confeſs our errors. From this ſource we may trace many of the ſects in religion & philoſophy, and the parties in politics.

3*dly*. Our errors are often the reſult of ſome predominant paſſion, which either prevents us from examining into the truth of things with impartiality; or, knowing the truth, hurries us on to act contrary to the cleareſt conviction.

4*thly*. We are often led into error by prepoſſeſſion or prejudice. We are very apt to adopt the opinions of our relations and friends implicitly, and without examination, from the good opinion we in general entertain of their judgment and candour; and it is often ſufficient reaſon for us to reject an opinion, becauſe it is advanced by a perſon whom we diſlike.

In opinions relating to ſcience we are very apt to ſupport, moſt ſtrenuouſly, thoſe doctrines which have been inculcated by our preceptors and profeſſors; and hence it is that errors have been perpetuated, and the progreſs of true knowledge exccedingly retarded.

5*thly*. The

5thly. The bulk of mankind are too lazy to think; eſpecially concerning opinions which from their complicated nature require a conſiderable exertion of the mental powers; and which, from want of habit and method, becomes painful and diſguſting; therefore they generally rely on the dictatorial authority of a few, who *being but men*, are therefore fallible, or, by various unworthy motives, are induced to miſreprent and miſlead.

I have entered more fully into this ſubject, on account of its great importance, and ſhall conclude with a profeſſional remark.

In no art or ſcience have errors been ſo frequently committed as in the theoretical and practical parts of medicine.

The ſpeculative opinions have often indeed been inoffenſive, though erroneous; becauſe thoſe who entertained them did not always permit them to influence their practice.

But the moſt fatal conſequences have ariſen from an imperfect analogy, by which a ſuppoſed fact, not altogether inconſiſtent with truth, has been adopted as a guide to ſome very important circumſtance of practice, to which, from the very remote ſimilarity between them, it is applicable only in a very limited degree.

Thus, from an imperfect knowledge of the different, and ſometimes oppoſite, natures of thoſe ſpecies of diſeaſe which is vulgarly diſtinguiſhed by the common name of *colic*, many moſt egregious errors are daily committed.

An ignorant nurſe has found relief perhaps, in her own perſon, from a dram of gin, probably warmed by pepper, or a full doſe of Turlington's drops; and ſhe preſcribes it on all occaſions of colical uneaſineſs, becauſe ſhe does not know that there is any other ſpecies of colic but the flatulent; in which her *infallible* remedy may not do much miſchief: but as there are ſeveral other ſpecies of colic of an oppoſite nature, the means ſhe preſcribes muſt in them be very injurious, and even fatal.

This remark is applicable to almoſt every diſeaſe, in the management of which egregious blunders muſt be committed, as often as we are guided by a ſlight conformity, inſtead of an accurate diſcrimination of all the circumſtances.

Ignorant practitioners, nurſes, and quacks, are very frequently led into ſuch errors; many of them becauſe they have never been in the habit of thinking at all; and even ſuch of them as enjoy a moderate portion of

common ſenſe, are yet utterly diſqualified to form juſt concluſions; becauſe they have neither ability nor patience to collect, compare, or judge of, the neceſſary premiſes.

With reſpect to thoſe whoſe underſtandings have been even highly cultivated by a general or even a ſcientific education, and who come under the denomination of Gentlemen or Lady-Doctors; howſoever the analogical and diſcriminating powers of their minds may have been exerciſed in particular branches of knowledge; yet when they employ them on medical ſubjects, they are perpetually liable to error in the application; for the ſame reaſon that a very learned lawyer, or a ſkilful phyſician, may not be a good polemical divine, a profound mathematician, or a ſkilful miniſter of ſtate; becauſe it is neceſſary that the human mind ſhould be long and aſſiduouſly engaged in a train of ſcientific thinking, before it can judge accurately concerning the ideas ſuggeſted by its objects.

Should it be alledged that, with reſpect to medicine, ſome medical men have *generouſly* ſupplied the public with plain treatiſes on diſeaſes and their cures; I anſwer, that ſuch productions

productions would no more qualify a perſon to practice phyſic with ſafety and ſucceſs, than his reading the article on watch-making in the *Encyclopedie* would enable him to rival *Mudge* or *Arnold*, or even a very inferiour workman in that branch; and it ought ever to be held in mind, that, in ſo much as we fall ſhort of the higheſt poſſible perfection in any art, we can be but ignorant bunglers in various degrees.

It may be proper to take ſome notice of the morbid changes made on the judgment, in conſequence of certain bodily diſeaſes.

§. 39. *Delirium* is a general term, which implies an error of the judgment produced by ſome morbid change in the brain, which is probably the ſeat of the ſoul; and therefore it is reaſonable to ſuppoſe that its faculties muſt be impaired by every change of this kind.

Delirium, in a more limited ſenſe, implies a diſorder of the underſtanding connected with fever; and when there is no apparent fever, the terms hypochondriaciſm, melancholy, and madneſs, are uſed, according to the nature and degree of the affection.

All theſe affections are ſuppoſed to proceed from increaſed rapidity of the circulation in the veſſels of the brain; to which it is ſuppoſed to be determined from other parts of the body with too much force, and in too great a quantity. This opinion is partly grounded on the qualities of certain cauſes which we know produce diſorders of the mental faculties; as rage, wine, and other fermented drinks, opium, &c. all of which are ſtimulants; and partly from diſſections of thoſe who have laboured under various kinds and degrees of delirium. In thoſe caſes the blood-veſſels of the brain have been found very much diſtended with blood, and ſometimes even burſt; inflammation of the membranes, matter formed in the ſubſtance of the brain; a very conſiderable quantity of watery fluid in the ventricles, &c. eſpecially in thoſe who have died of fever. In thoſe who have died of melancholy, madneſs, &c. beſides ſome of the appearances juſt mentioned, the ſubſtance of the brain has been found of a very hard and firm texture, ſometimes of an unuſually ſmall ſize, and ſometimes ſwellings in particular parts of it, of a ſchirrous, ſtony, or bony nature, &c.

When we conſider the intimate connexion between mind and body; eſpecially the brain, which is the ſource of ſenſation and perception, and the ſeat of the thinking faculty, it will not be difficult to conceive, how morbid changes made in the brain do, and muſt neceſſarily derange the imagination, and impair, or totally unhinge, the faculty of judgment; inſomuch as that it ſhall not be able to diſtinguiſh between truth and error, reality and fiction.

When we conſider the deplorable perverſion of the moſt exalted genius, the moſt refined underſtandings, and the moſt amiable diſpoſitions, by corporeal cauſes, it ſhould not only impreſs us ſtrongly with the deepeſt humility; but warn us againſt thoſe exceſſes, eſpecially of the paſſions, by which the reaſoning faculty, the nobleſt privilege of man, may be totally and irremediably unhinged: a ſtate worſe than death itſelf.

The perverſions of reaſon and the imagination are very ſurpriſing. Beſides thoſe which occur in fevers, I ſhall mention a few inſtances, out of many which occur in madneſs and melancholy.

Some of thoſe patients, whilſt in every other reſpect the judgment ſeems to be ſound, err only with regard to one object or idea, excited generally by ſome inordinate paſſion, as anger, love, ambition, &c. and the correſponding ideas are almoſt perpetually preſent.

Some imagine themſelves kings, princes, &c. To others the objects of their affection, their hatred, or their revenge, almoſt conſtantly preſent themſelves.

The ſuperſtitious madman is tortured by the conſtant dread of eternal puniſhment; whilſt the preſumptuous enthuſiaſt is elated by the idea of his intimacy with GOD; and ſome of them have believed themſelves to be GOD himſelf.

The ruling paſſion, which chiefly occupied the attention in health, generally preſerves its dominion in the diſtracted mind.

None are ſo much objects of compaſſion, but who ſeldom meet with it, as thoſe who, from an irritable ſyſtem of nerves, and a delicate ſtate of health, labour under the various degrees of hypochondriaciſm, up to incurable melancholy.

With theſe unhappy people, the prevalent idea is a conſtant and painful ſolicitude about

about health, excited chiefly by a fear of death, rather than by an anxiety about the comfortable enjoyment of life.

The whimſical ideas and apprehenſions of ſuch perſons, though generally ſubjects of ridicule to others, are, to the ſufferers, real and grievous evils.

One man aſſerted that he was made of glaſs, and therefore would not quit his houſe, leſt he ſhould be broken: another that his legs were ſtraws, and could not ſupport his body: a quondam patient of mine being, in his way to a ball-room, obliged to paſs through a narrow lane, conceived himſelf to be ſo enormouſly ſwelled that he could not paſs it, returned, went to bed, and ſent for his phyſician. Some have conceived themſelves to be transformed into beaſts, birds, and even inſects; others, that they were dying, dead, or abſolutely buried.

In all theſe caſes the patients are ſeldom convinced by argument; though ſome are not always proof againſt the ſhafts of ridicule, the arts of deception, or a powerful and *feeling* appeal to the ſenſes.

A perſon who inſiſted that he had no legs, and therefore could not move, was convinced by

by ſome ſmart ſtrokes on the ſhins; another who believed that he had no vital warmth, was cured by wetting ſome of the cloaths he wore with ſpirit of wine, and ſetting them on fire. Whatſoever excites a powerful impreſſion of a nature contrary to the predominant inſane idea, will often produce a ſalutary effect.

§. 40. *Idiotiſm*, in its various degrees, ſeems to be oppoſite in its nature to delirium; the latter being the conſequence of the impreſſions on the mind being too ſtrong and vivid, the former being produced by their being too weak. The cauſes of idiotiſm and loſs of memory appear, on diſſection, to be nearly the ſame.

In a particular diſtrict of Switzerland, a very conſiderable proportion of the inhabitants are born idiots: perſons of great talents, or who ſpend much of their time in intenſe ſtudy, often become drivellers in advanced life; and perſons labouring under diſeaſes ſometimes fall into this ſtate.

Sometimes perſons are recovered from this ſtate by ſome powerful ſtimulus producing a great and ſudden change in the ſyſtem; as by

by wine, ſudden joy, &c. and in one inſtance it was effected by inoculating the itch.

I ſhall conclude this ſubject, by remarking, that as the degrees of madneſs and folly are very numerous; and as, from the imperfection of human nature, the wiſeſt men are not exempted from a mixture of both in their compoſition; ſo, the ſpeculative obſerver of human life and manners will readily accord with *Damaſippus*,[b] that all men are mad in ſome degree, but that in ſome the fits are leſs violent, and the intervals more lucid, than in others.

§. 41. *Pleaſure and Pain.* I have already remarked, chap. I. §. 9, that bodily pleaſure and pain are both modifications of ſenſation.

It would be difficult to determine, in every inſtance, what change is produced in the nerves, by which a pleaſurable or a painful ſenſation is excited; or why ſome colours, ſounds, and taſtes, are grateful or diſagreeable to our ſenſes; why, for inſtance, the ſmell of the roſe is preferred to that of the nettle.

There ſeems to be, in many inſtances, but a very thin partition between pleaſure and pain;

[b] Horat. Sat.

pain; tickling to a certain degree is pleaſureable; but in exceſs, painful. Whether we have any pleaſure in the ſenſe of our exiſtence, is perhaps doubtful; we are however certainly gratified in the indulgence of the appetites of eating and drinking, by which it is preſerved; though not always in the objects of the other ſenſes, in which the perceptions are often indifferent: thus I view a triangle without either pleaſure or pain.

I have already remarked §. 20, that even painful ſenſations are productive of ſalutary effects, and the Supreme Being has interwoven a reliſh for pleaſurable ſenſations with our frame, to excite us to the performance ofthoſe duties which are neceſſary to our preſervation.

§. 42. *Appetites* are the propenſities alluded to §. 41. Theſe we have in common with other animals, who are inſtinctively excited to eat and drink for their preſervation.

The inſtances of depraved appetite are many, and ſome of them ſurpriſing. The longings of pregnant women are well known. Thoſe of perſons labouring under certain diſeaſes afford a ſtrong proof of that inſtinctive

ſtinctive ſagacity, which, in health, is almoſt totally extinguiſhed by the force of education and cuſtom.

The ſkilful phyſician will eaſily diſtinguiſh this ſalutary craving, excited by uneaſy morbid ſenſations, from depraved habits of indulgence; and whilſt he will gratify the former to a degree which rigid rules of regimen might not warrant, he will endeavour to regulate, and even reſtrain, the latter, as injurious to the welfare of the patient.

§. 43. The appetites are connected with the *Will*, which is that action of the mind by which it prefers certain conditions to others; inclining us to enjoy what is good, and to avoid what is evil, or inimical to our corporeal ſafety. The will of brutes is inſtinctive, and in a great degree irreſiſtible; and indeed this is in ſome degree the caſe with man, with reſpect to ſome of his appetites when very urgent; which ought however to be under the regulation of reaſon. Thus, a man, in gratifying his hunger or thirſt, ought to ſtop ſhort of that exceſs in the indulgence of either as may be injurious to him. But what ſhall we ſay to the wanton abuſe

abuſe of nature, by creating and indulging artificial inclinations, to the utter perverſion of our natural appetites? Do we not daily anticipate our natural cravings, by eating without hunger, and drinking without thirſt?

The will alſo excites us to ſeek thoſe conditions or ſituations which may conduce to our eaſe; and to avoid whatever may be hurtful to us; but as what may be apparently beneficial, may be really injurious, we are endued with the faculty of comparing and judging concerning cauſes and effects. But here alſo the will is miſled by erroneous concluſions, or the arbitrary influence of the paſſions; and we often chooſe preſent gratification, though conſcious that it will be followed by future inconvenience, diſtreſs, or danger.

I formerly obſerved §. 13, that ſome of the functions of the body are under the direction of the will; and whilſt the organs are in a healthy ſtate, whatever we will, they perform. Thus, if I will to move my arm, a variety of muſcles conſpire to move it inſtantaneouſly, in this or that direction, and with a degree of force and celerity adapted to the occaſion. But the will cannot always be obeyed;

obeyed; it may be counteracted by a ſenſe of inconvenience, as when a gouty man, though he wiſhes to change his poſture, may be reſtrained by the fear of pain; or the muſcles may be totally unable to act, as in the caſe of a paralytic limb.

Though it is admitted in general by phyſiologiſts, that many of our functions are performed without the interpoſition of the will, and merely by re-action in conſequence of ſtimulus, as when the heart acts when excited by the heat, bulk, &c. of the blood; yet ſome alledge that the will or mind, without our being conſcious of it, ſuperintends, and with the utmoſt wiſdom and ſagacity, directs all the operations of the œconomy, whether in health or diſeaſe; in the former caſe ſilently, in the latter often perceptibly, and even powerfully. This ſuperintending power has been called *Nature*, a term which has been often a refuge of ignorance.

But is Dame Nature ſo ſapient as always to direct for the beſt purpoſe? When fear is excited by a ſenſe of danger, what more abſurd effect could be produced, than tremor and debility, which diſqualify us from exerting ourſelves either to reſiſt or to flee from danger?

It

It is alledged, that when the body is attacked by a morbid cauſe, nature excites motions beſt fitted to remove it. But the very reverſe is the caſe; for when a concretion blocks up the gall-duct or kidney, inſtead of widening the paſſages to promote its removal, ſhe excites pain to ſtraiten it, and prevent its paſſage. What benefit do we derive from epileptic and other convulſions? No benefit, but much injury. She promotes, ſay they, the beneficial criſis of fevers; this is not true, otherwiſe why are ſo many deſtroyed by fevers, without the aſſiſtance of the doctors?

§. 44. The *Paſſions*, or affections of the mind, being as it were emanations of the ſoul, and of a nobler nature than the appetites; though they are poetically called *the gales of life*, are more frequently the *hurricanes* and whirlwinds of it; and manifold are the evils, both phyſical and moral, which reſult from their exceſs or perverſion.

The influence of the paſſions on the organs of the body are very great, even in health. They may be divided into the ſtimulating or exciting, and the ſedative or depreſſing

depreſſing paſſions. Among the former we may reckon joy, hope, anger, love, ſtudy, which is a ſpecies of this affection, and ſhame. The depreſſing are, pity, grief, fear, terror, anxiety, deſpondency, averſion, and hatred. Theſe effects are, however, often of a mixed kind according to the degree.

The paſſions are manifeſted by various changes of the countenance and voice, but eſpecially of the *eye*, which may be truly deemed the index of the mind; hence the foundation of phyſiognomy, a ſtudy very neceſſary to medical men.

§. 45. The paſſions not only produce many diſeaſes, but they exceedingly exaſperate them. There are many inſtances on medical record of the ſurpriſing and dreadful effects of violent paſſions; and many have been inſtantaneouſly deſtroyed by them.

As they chiefly and more immediately affect the brain and nervous ſyſtem, and, through them, every other organ and function of the body; ſo on inſpecting the bodies of thoſe who have died from violent paſſions, there were the ſame appearances of diſeaſe in the brain, as are enumerated under delirium, madneſs, and melancholy.

With

With reſpect to thoſe diſeaſes which are uſually deemed imaginary, many of them may be ſo at their commencement; but ſuch is the influence of the mind over the body, that the latter is eventually affected, and an imaginary is converted into a real diſeaſe.

This ought to be a powerful incentive to hypochondriacal perſons, to reſiſt, or divert, thoſe workings of the imagination, which embitter life, and muſt infallibly produce thoſe very evils, which as yet exiſt only in imagination.

Such unhappy perſons are frequently the dupes of knaves, who often convert ideal into real diſeaſes; whereas a phyſician of ſkill and candour will readily diſtinguiſh the cauſe, and if he diſcovers it to be real, he will uſe his utmoſt endeavours to procure ſpeedy and effectual relief; if imaginary, his knowledge of the human heart, and of the influence of the mind on the body, will enable him to alleviate thoſe perturbations of mind, which are the ſources of much anxiety and diſtreſs.

BOOK III.

Of the VITAL ORGANS and FUNCTIONS.

CHAP. I.

Structure of the Heart—Of the Arteries and Veins—Circulation of the Blood——Various Cauſes of the Circulation explained—The importance of the Circulation to the Vital, Animal, and Natural Functions—Reſult of Experiments made by Transfuſion of Blood into the Veins—Of transfuſing Remedies by the Veins—Determination its nature.

§. 46. THE *Vital Functions* are ſo called, becauſe it has been ſuppoſed that they are more peculiarly neceſſary to life than the animal or natural functions; but this, as I have already remarked, is not ſtrictly true.

The *Vital Organs* are chiefly the *Heart* and *Lungs*, ſituated in the middle cavity of the body, and defended by a bony caſe; behind by the ſpine or back bone, on the ſides and before by the ribs and ſternum or breaſt bone.

§. 47. *The Heart, and Circulation of the Blood.* The *Heart*, which is the centre of motion in our ſyſtem, is a hollow muſcle ſituated on the left ſide of the breaſt, and incloſed in a membranous bag. It conſiſts of four diſtinct cavities or chambers, or rather of two pairs, called the right and left *auricles* and *ventricles*, which are divided by a partition. To theſe chambers are joined ſeveral large tubes or blood veſſels, and, at the ſeveral openings of communication, are placed valves, or flood-gates, which open and ſhut occaſionally. The heart is amply ſupplied with nerves.

When the *blood*, being the *natural ſtimulus* of the heart, paſſes from the great vein into the right auricle, the auricle contracts and puſhes it forward into the right ventricle, which, contracting in its turn, propels the blood into a large artery, and this conveys it to the lungs; which, being contiguous to the heart, quickly ſend it back again by a vein, which empties itſelf into the left auricle, and the auricle being filled, contracts and thruſts the volume of blood into the left ventricle, which diſcharges it into the great artery; by the branches of which it is diſtributed to

every

every part of the body (except the lungs) and returns again into the great vein, which communicates with the right auricle: the uſe of the flood-gates is to prevent the blood from returning back into the cavities from which it had been juſt diſcharged.

Thus the *Circulation* of the blood is performed; which was diſcovered in the laſt century by the celebrated Dr. *Harvey*, Phyſician to King CHARLES the firſt. Before that period, very erroneous opinions were entertained concerning the manner in which this important function was performed.

§. 48. The uſes of the circulation are manifold and important.

1*ſt*. By it the powers of life and motion are almoſt ſolely ſuſtained; for when it ceaſes, death ſoon enſues: but it may be apparently ſtopped, as in ſwoons, and even the motion of the heart and arteries ſuſpended for hours, and yet the patient recover:—a caution againſt early burials.

2*dly*. It is the chief ſupport of reſpiration; for in faintings breathing is almoſt entirely ſuſpended; and fevers and other diſeaſes of the heart affect the lungs very much.

3*dly*. The functions of the brain and nervous ſyſtem have a peculiar dependance on the circulation; and hence it is that ſenſation, motion, and the faculties of the mind, are peculiarly deranged by fevers, and other irregularities of the circulation.

4*thly*. As the blood ſupplies all the other humours of the body, ſo a ſound ſtate of the circulation is a chief cauſe of health in digeſtion, and all the ſecretions and excretions.

5*thly*. Nutrition depends peculiarly on a regular circulation, therefore the body cannot be properly nouriſhed in diſeaſes depending on morbid circulation.

§. 49. The *Arteries* which convey the blood from the heart, being endued with a muſcular contractile power, are conſiderable aſſiſtants to the heart in preſſing forward to every part of the body the blood, which they diſtribute by an infinite number of branches, and which, becoming at length exceedingly ſmall, unite with other pipes called *Veins*, which gradually increaſing in ſize, unite at length in the large vein which opens into the right auricle.

Hence

Hence it appears that there is, as it were, a double circulation; one between the heart and lungs, and another between the heart and the reſt of the body. But as the unborn infant does not breathe, ſo a very ſmall quantity of blood goes to the lungs before birth, the reſt being diverted by a tube which is ſhut up after birth.

The arteries are of different kinds, and their cavities are cylindrical and not conical; they have different layers of coats, one of which, being muſcular, enables them to contract, and puſh on the blood. The coats of the ſmaller arteries are thicker in proportion than thoſe of the larger, and hence they are leſs liable to be burſt. They generally branch off at acute angles, and join or anaſtomoſe ſeveral times in their courſe.

They terminate in various ways.

1*ſt*. The arteries convey red blood into red veins.

2*dly*. They branch off arteries of a ſmaller ſize, which receive a yellowiſh fluid called *ſerum*, which is thinner than blood.

3*dly*. Many of them open in veins called *lymphatics*, to be deſcribed in Book IVth.

4*thly*. Many of the ſerous arteries empty their humours into the cellular membrane in almoſt every point of the cavities, interſtices of veſſels, nerves, and muſcular fibres, which they nouriſh and moiſten.

5*thly*. The fine arteries diſcharge the matter of perſpiration on the ſkin, and in the cells of the lungs.

§. 50. Veins have ſtronger coats than arteries, but have no muſcular coat, and therefore do not contract; they have valves or flood-gates, which prevent the blood from flowing back again in its courſe to the heart; the veins therefore carry the blood in a contrary direction from that of the arteries. The veins are,

1*ſt*. The red veins, which receive blood from the red arteries.

2*dly*. The lymphatics, which ſuck up or abſorb all the fluids from the cellular membrane and every cavity, and communicate with glands, &c. and uniting, carry all theſe humours back to the heart, through a duct lodged upon the ſpine.

The blood-veſſels are every where accompanied by nerves, by which means every organ

organ is ſupplied with blood and ſenſation; and theſe branches are ſo minutely diſtributed, that if we thruſt the fineſt needle into the ſkin, pain is excited, and blood diſcharged; a proof that both nerves and blood-veſſels are wounded.

§. 51. I have obſerved that the blood is the natural ſtimulus of the heart and arteries. The qualities by which it excites thoſe organs, are its bulk or volume, its heat, and a certain degree of pungency.

§. 52. The *volume* of blood being an antagoniſt to the muſcular power of the heart and arteries, ſtretches their ſides, and irritates their nerves; and their muſcular fibres are thereby urged to a convulſive contraction, by which the cavities are emptied; when another torrent of blood ſucceeding to the former, they are again filled, and again contract. The contraction of the heart and arteries is called their *ſyſtole*, and the interval between one contraction and another, during which the arteries are diſtended with blood, is called their *diaſtole*.

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The throbbing of the heart, and the pulsation of the arteries, or what is commonly called the *pulse*, takes place during the diastole or dilatation of those cavities by the influx of blood; and they are not merely stretched, but actually moved out of their places, by the force of the torrent.

The *pulse* is different in degrees of strength and frequency, according to the different periods of life, and other circumstances; in a new-born infant it beats about 134 times in a minute, in middle age from 60 to 80, and in extreme old age from 50 to 24. It is generally quicker in women than in men; it is slower in the morning than at night; fasting than after a meal; when we are rest than when in motion; asleep than when awake; in cold than in hot weather; and the various passions of the mind produce considerable changes of the pulse. Hence the impropriety of invalids consulting their pulse instead of their feelings. I was lately consulted by a whimsical patient, who declared that from the quickness of his pulse, he had laboured under a fever for twenty years.

§. 53. Another

§. 53. Another exciting cauſe of the heart's motion is the *heat* of the blood, which is from 96 to 98 degrees of Farenheit's thermometer. Heat we know is a powerful ſtimulant.

Philoſophers are not agreed about the nature and cauſes of heat in general. Sir *Iſaac Newton*, and moſt of the Britiſh philoſophers, have conſidered it as an effect of motion; the foreign philoſophers alledge, and I believe juſtly, that heat and flame are not generated, but merely extricated, by motion; fire being a conſtituent principle of all bodies, and remaining there in a quieſcent ſtate, and only ſet in motion by accidental cauſes.

Phyſiologiſts have not been unanimous with reſpect to the cauſe of heat in animal bodies; but if we only ſuppoſe that a portion of it exiſted at our firſt formation, we may eaſily account how its activity is ſupported by the motions of our ſyſtem, and may be occaſionally increaſed by various cauſes.

Of theſe cauſes the chief is the motion of the circulating blood; hence ſtrong exerciſe, and fever, which increaſe the force of the circulation, always increaſe the heat of the body; and ſome appearances afford reaſon

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to ſuſpect, that an inteſtine motion of the fluids, or fermentation, may contribute as a cauſe; together with the electric fire, which is a component principle of the human ſyſtem.

The human body will, under certain circumſtances, bear a very extraordinary degree of heat. Meſſrs. *Du Hamel* and *Tillet* found that the female ſervant of a baker could bear the heat of an oven for ſome time, when at 325 degrees; which was 113 degrees above that of boiling water. Some gentlemen repeated the experiment in London, and remained a conſiderable time in a room wherein the thermometer ſtood at 211; a heat ſufficient to roaſt eggs, and broil beef-ſteaks. But without having recourſe to an hypotheſis, more ingenious perhaps than true, that the body reſiſted the impreſſions of this extreme heat, by an innate power of generating cold; it may be accounted for on the ſimple principle, that the heat of bodies is always in proportion to their denſity, and that of the human body being much leſs than that of glaſs, mercury, or other metals, and air being much leſs denſe than either, we can eaſily apprehend that the heat of the

body

body might not much exceed 100 degrees, and it is very probable that the heat of the air in the room was conſiderably leſs.

The heat of the body in high fevers is about 108 or 110.

When the temperature of the air approaches that of the body, it acts as a ſtimulus to the circulation, and increaſes the ſenſibility of the body; but eventually relaxes the ſolids, weakens the force of the circulation, and enfeebles the whole body. Hence it is that in hot climates, where the heat is equal to, or even greater than, that of the body, during the greateſt part of the year, the natives are enfeebled and enervated both in body and mind.

§. 54. *Cold* has, by ſome philoſophers, been ſuppoſed to be a poſitive quality; but it is really no more than a diminution of heat, as even the coldeſt bodies contain latent fire. Moderate cold braces and invigorates the body; but in the extreme, chills all its powers and faculties. In Siberia, the cold is ſo intenſe as to freeze brandy, and by its ſedative power quickly ſuſpends the powers of life, if not reſiſted by exerciſe; and the

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late ingenious Dr. *Solander* was nearly deſtroyed in this way.

Artificial cold, produced by certain mixtures, congeals even quickſilver into a malleable maſs.

§. 55. It is alſo ſuppoſed that the blood acts as a ſtimulus, by the pungency of ſome of its principles, particularly the ammonical ſalt.

The *Blood* conſiſts of red particles ſwimming in a yellowiſh fluid called ſerum. The ſhape of the red particles has been generally ſuppoſed to be globular, but they have lately been diſcovered to be flat.

The blood in a ſound ſtate is of a florid red, owing, as ſome think, to the iron in our fluids; but it is more probably the reſult of original conformation, though it is often changed in its colour, even in health, without any aſſignable cauſe. In diſeaſes it has been ſometimes ſurpriſingly changed; in one patient it appeared of a cryſtaline colour, in another white, in a third of a bluiſh aſpect; and in ſome caſes black. Beſides the changes it undergoes in its colour, its conſiſtence is alſo frequently changed in diſeaſes;

in

in ſome caſes it is pale, thin, and watery; in other denſe and buffy; and in ſome putrid diſeaſes, its texture ſeems to be deſtroyed. But it muſt be confeſſed that theſe appearances cannot be much relied on as indications of the nature of diſeaſe; for it is often apparently ſound in violent diſeaſes, and its aſpect is ſometimes different in different cups of blood taken at the ſame bleeding.

Theſe obſervations are not made merely to gratify curioſity, but to obviate and counteract ſome ill-founded notions which many patients and ſome practitioners are apt to entertain concerning a ſuppoſed connexion between certain diſeaſes and the appearance of the blood. It has been too frequent a practice to take away a little blood *to ſee how it looks*; and when thought to be bad, more perhaps has been taken for that reaſon; but when called in, I have ſometimes had reaſon to wiſh that the experiment had been omitted, either as unneceſſary, or improper.

As the blood flows from a vein, a fine vapour exhales from it, which is ſuppoſed to contain a portion of the volatile ſalt, which by its pungency ſtimulates the heart and blood-veſſels. As this vapour is ſuppoſed to be

be elaſtic, and ſuſceptible of different degrees of expanſion or rarefaction, in proportion to the heat of the body, it is believed by ſome that it produces an inteſtine motion of the other principles of the blood, and preſerves their fluidity.

The ſerum contains a mucus, or glutinous matter, which is ſuppoſed to be the chief matter of nouriſhment.

It has been ſuppoſed that one globule of blood is divided into ſix globules of ſerum, one globule of ſerum into ſix of lymph, and ſo on in decreaſing ſeries; but later microſcopic obſervations do not ſeem to confirm this opinion.

The blood is thought to contain about one thirtieth part of air, partly perhaps phlogiſticated, partly fixible, and ſome have aſſerted that there is common air in the blood.

Blood, very ſoon after it is expoſed to the air, is formed into a ſolid red maſs, from which the ſerous or watery part ſeparates ſlowly. On the top of the red maſs there is ſometimes a coat of a buff colour, which has often been miſtaken for a ſign of diſeaſe, though it is frequently accidental. The proportion of the groſſer and thinner parts of the

the blood is different in different perſons; the red and mucous particles not only abound in ſtrong laborious people, but they are more compact and firm; and the reverſe in lax and delicate conſtitutions. As every perſon's blood therefore ſeems to be ſo peculiarly adapted to his own ſyſtem, the attempts made in the laſt century to transfuſe blood from one animal to another, could not be expected to ſucceed. The reader may be amuſed by ſome account of this curious experiment.

After various experiments made on brutes, by which an equal quantity of blood was drawn off by one vein, as was transfuſed by another, ſo that no injury might be ſuſtained by over filling the veſſels, the experiment was at length made on the human body. The expectations formed from this experiment were very high; eſpecially as ſome old animals, particularly a dog and a horſe, ſeemed in ſome degree to have renewed their vigour, by exchanging part of their blood for that of younger animals.

Some of the firſt experiments made on men did not ſeem to be followed by any bad effect, and indeed after the firſt trial made at Paris on a young idiotical perſon, into whom

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ſome ounces of the blood of a lamb were transfuſed, he ſeemed to have become more alert and ſenſible; but on a ſecond experiment he was ſeized with a phrenzy, and died apopleptic. Notwithſtanding this dreadful event, they had the audacity to repeat the experiment on another perſon in France, and on two in Italy; and all of them being evidently deſtroyed by it, the practice was prohibited.

The experiment was alſo made in this country, and the Royal Society had determined to repeat it, but were happily reſtrained by previous information of the fatal event at Paris.

Experiments have alſo been made by *Mr. Boyle*, *Sir Chriſtopher Wren*, and others, by infuſing wine, opium, &c. into the veins of animals; and not long ago a phyſician at Guadaloupe made ſeveral experiments on the human body; and from ſome trials, by which perſons are ſaid to have been cured of inveterate diſeaſes by this means, the expedient ſeems to merit attention, eſpecially as we are aſſured that alarming ſymptoms from the bite of a viper were removed by injecting ſpirit of hartſhorn diluted into the blood.

It is worthy of remark, that wine, opium, emetics, and purgatives, thus tranſmitted into the circulation, had the ſame effects as when taken into the ſtomach.

The quantity of blood ſuppoſed to be contained in a middle-ſized man is about twenty-eight pounds.

§. 55. Another cauſe by which the heart and arteries are ſtimulated to contract, and promote the circulation, is the *reſiſtance* made to their power on the ſurface of the body, and in the lungs, by the *weight* of the atmoſphere; which obliges them to exert their powers to overcome this reſiſtance, otherwiſe the circulation muſt ceaſe.

This incumbent weight of the air is about 3000lb. which, the barometer ſhews, is perpetually varying; the weight being greateſt when the mercury ſtands at the greateſt height: hence invalids are affected by changes of weather, eſpecially by the fall of the barometer, the ſolids being leſs braced and ſtrengthened in proportion as the weight of the air is leſſened.

The motion of the blood is not equally ſtrong and rapid in every part of the body;

for it becomes more ſlow as the arteries become ſmaller, and form angles, which increaſe the friction, and conſequently the reſiſtance.

The force of the heart is very great, but philoſophers have not agreed in the eſtimate; which ſome have equalled to the weight of 180,000 pounds, others deemed it much leſs. It is certainly conſiderable, though not reducible to calculation: it is ſuppoſed to be ſo great, as to move the column of blood 3000 feet in leſs than a minute, if there were no obſtacles to its progreſſive motion.

But notwithſtanding the various and great reſiſtances to the propulſive power of the heart, from the ſides of the arteries, the angles and flexures they make in their courſe, and the weight of the atmoſphere, &c. the rapidity of the blood's motion is ſo great, that, according to computation, 9600 ounces or 600 pounds of blood paſs through the right ventricle of the heart every hour, or about ten pounds in every minute; but no accurate calculation can be made of the time in which the whole maſs of blood returns to the heart, becauſe of the inequality of its motion in the different ſtages of the circulation; as its motion

tion through the ſmall arteries and the veins is much ſlower than through the heart and large arteries.

To prevent a ſtoppage in the circulation through particular veſſels, from ſome impediment to the paſſage of the blood, the arteries communicate with each other; and when it cannot paſs by one branch, it returns back, and enters another, where there is no impediment.

The motion of the blood may be divided into *progreſſive* and *inteſtine*. The nature of theſe motions will be explained when we conſider the affections of the circulating ſyſtem.

During health there is an equal diſtribution of blood to every organ in proportion to its ſize; and the conſtitution, by its innate powers, endeavours to rectify any ſmall changes in the balance of circulation.

But we ſhall ſee hereafter, that many violent and dangerous diſeaſes proceed from exceſſive changes of this balance, owing to the current of the circulation being irregularly and permanently *determined* on particular organs.

Book III.——Chap. II.

Respiration.

Organs of Reſpiration deſcribed—Inſpiration—Expiration—Uſes of Reſpiration—Air——Qualities of it neceſſary for healthy Breathing—Dangerous Effects of Foul Air—An important Caution to the Maſters and Miſtreſſes of Public Schools—to Parents—Affection of the Breath on high Mountains—Cauſes which probably deſtroy the vivifying principle of the Air—Articulation, the Organs of it—Morbid Affections of the Vital Powers—various kinds exemplified—Morbid progreſſive and inteſtine Motion of the Blood—Morbid Determination—various kinds—Fever, its general nature—its varieties—Inflammation—Hæmorrhage—Morbid Affections of Articulation.

§. 56. THE *Larynx*, or wind-pipe, is ſituated in the upper and fore part of the neck, and is formed of ſeveral hollow cartilages, which have a narrow opening into the throat, immediately behind the root

root of the tongue; this opening is covered by a moveable cartilage, which allows the air to paſs to and from the *lungs*, but guards the paſſage againſt the entrance of our foods and drinks. As the wind-pipe deſcends toward the lungs, it is formed of thin cartilages not compleatly circular, connected by a thin membrane. Having deſcended ſome way into the breaſt, the wind-pipe becomes entirely membranous, and entering the ſpongy ſubſtance of the lungs, is divided into a great number of ſmall tubes which terminate in cells, on the ſurface of which an infinity of ſmall arteries and veins are diſperſed, and many veſſels of a ſtill ſmaller order open into the cavities of thoſe cells. The lungs are ſupplied with conſiderable nerves which accompany the blood-veſſels.

The *Diaphragm*, or midriff, is a muſcular membrane which divides the cavity of the breaſt from that of the belly. Between the ribs there is a double ſet of muſcles, and the belly is alſo covered with various muſcles—all the organs deſcribed aſſiſt in the office of reſpiration.

The column of atmoſpheric air deſcends through the larynx into the cavity or air-

cells of the lungs, the expanſion or inflation of which is favoured by an enlargement of the cavity of the breaſt, owing to an elevation of the ribs, and a deſcent of the diaphragm. This is called *inſpiration*. But the air being ſoon heated and rarefied in the lungs, ſtimulates the nerves of the air-cells, and we are inſtinctively obliged to diſcharge it by *expiration*; otherwiſe we ſhould ſoon be ſuffocated, as happens to perſons who are drowned or ſtrangled. The expulſion of the air is promoted by the contraction of the muſcles of the ribs, and of thoſe of the belly, the latter preſſing the midriff upwards; by all which the cavity of the breaſt is leſſened, and the air preſſed out of the lungs.

The rarefaction of the air remaining in the lungs after each expiration, favours the the deſcent of the heavier column of atmoſpheric air; and this ſeems to be a chief cauſe of inſpiration: The motion of the blood through the arteries of the lungs is very rapid during the expanſion of the cells by inſpiration; but much retarded during expiration; whilſt the return of the blood through the veins is promoted. Reſpiration promotes the circulation through the veſſels of the liver,

ſtomach,

ſtomach, inteſtines, ſpleen, &c. by the alternate deſcent and elevation of the diaphragm.

The uſe of reſpiration is to cool the blood ſent from the heart; and to carry off a fine vapour diſcharged from the ſmall veſſels, and which contains the impure and phlogiſticated parts of the blood; and it is a curious fact, that whereas animals that breathe, are ſuffocated when the communication with the external air is ſuſpended for a time, becauſe the impure vapours cannot be carried off; ſo on the other hand, vegetables die, when they cannot diſcharge their pure air, and receive impure air, which conſtitutes a chief part of their nouriſhment. As the generation of noxious air, by a variety of cauſes, muſt be ſo great, that in the courſe of many centuries it muſt have been ſo accumulated, as to have been abſolutely deſtructive of animal life; the great and wiſe Author of our being has ſo ordained, that the impure air ſhall not only be attracted by the ſeas, rivers, and vegetables, but that the latter ſhall exchange it for, probably convert it into, pure air, fit for animal reſpiration.

As the blood undergoes a very conſiderable degree of preſſure and agitation in the lungs, its

its principles are thereby more intimately mixed; and ſome ſuppoſe that they impart the red colour to the blood.

There is a peculiar connection between the heart and lungs, not only from their contiguity, but from the great quantity of blood, (being nearly half of the whole maſs) which paſſes to and from the lungs with great rapidity; hence the heart and lungs are mutually and powerfully diſturbed by the morbid affections of each, thoſe eſpecially accompanied with fever. Air blown into the lungs of a dog by a bellows, reſtored the motion of the heart after it ceaſed; a proof that reſpiration and circulation are intimately connected.

The proportion of inſpirations to the pulſe is about one to four: ſtrong exerciſe, and all other ſtimulating cauſes, quicken the reſpiration and the pulſe.

Sneezing and cough are convulſive contractions of the muſcles ſubſervient to expiration, excited to diſcharge ſome irritating cauſe; ſo is vomiting and hiccup: yawning is a protracted inſpiration; laughter, ſobbing, and ſighing, are efforts of reſpiration.

§. 57. The

§. 57. The air being the *natural ſtimulus* of the lungs, the purer and heavier it is, it is fitter for reſpiration, and therefore we always find ourſelves more lively and alert in a pure air; and the very ingenious Dr. *Prieſtly* informs us, that his breathing and feelings were remarkably pleaſant, when he breathed that kind of factitious air which he calls dephlogiſticated, which is much purer than the common atmoſpheric air; of which not above one third is pure, the remainder conſiſting of various noxious exhalations from animals, vegetables, and minerals.

From a variety of experiments the following inferences may be fairly deduced.

1ſt. That common or atmoſpheric air is probably a particular element, and that the pureſt kind of it is that which approaches neareſt to Dr. *Prieſtly*'s dephlogiſticated air; but that common air can never exiſt without ſome acceſſory ſubſtance, by which it is more or leſs tainted.

2dly. That this acceſſory ſubſtance is of various kinds, and amongſt theſe none more frequent than acid and phlogiſton, or the inflammable principle, and that the pureſt air is that which has leaſt of the phlogiſton; retaining,

taining, however, a ſmaller proportion than uſual of fixible air, which is a peculiar acid combined with common air.

3*dly*. That there is a ſenſible difference between the air of different places, and even between that of the different parts of the ſame city, owing to the greater or leſs prevalence of thoſe ſubſtances.

4*thly*. That nature, as I have before remarked, has carefully provided the means of preventing the too great accumulation of acceſſory or foreign ſubſtances, which always more or leſs diminiſh the purity of the atmoſphere.

I have, in a former eſſay[a] pointed out the dangerous effects of impure air, and hot crouded rooms; and theſe effects are ſo much the more dangerous, as they do not always immediately manifeſt themſelves in the form of diſeaſe; and when they do, the diſorder is rarely attributed to the right cauſe.

Each perſon is ſuppoſed to deſtroy the vivifying principle of a gallon of air in a minute, by the impure vapour which is diſ-

[a] Part I, Eſſay 2d.

charged

charged from the lungs and ſurface of the body by perſpiration: and hence the neceſſity of frequently ventilating and renewing the air of our apartments, eſpecially if ſmall and crouded.

There occurred, about four years ago, a very remarkable inſtance of the dangerous effects of foul ſtagnant air.

Eighteen charity children, and a ſervant, lay in one apartment of a houſe in King-ſtreet, Golden-ſquare. To render the room warmer, they ſhut up the chimney, and uſed every other expedient to exclude the cold air.

The ſervant and ten of the children were ſeized with excruciating pains in the pit of the ſtomach and back, violent head-achs, delirium, and convulſions; all which ſymptoms could only be attributed to foul air.

To preſerve the healths, and amend or confirm the conſtitutions of the riſing generation, is certainly an object of great importance. I have been led to make this remark, not only in conſequence of the accident which happened to the charity children, but of what occurred lately in the caſe of a young lady who was my patient at Bath. Therefore ſchool-rooms, and bed-chambers, where

where a number of young perſons are crouded together, ought not only to be ſpacious, but well ventilated; and I do moſt earneſtly recommend to the maſters and miſtreſſes of boarding-ſchools a due attention to this circumſtance; and to parents, that they enquire into the manner in which their children are accommodated in this reſpect.

The ſame precaution is neceſſary with reſpect to nurſeries; eſpecially, as ſervants are, in general, both from habit and prejudice, fond of hot and cloſe apartments.

From what has been ſaid concerning the weight of the air under the preceding ſection, we can account why people who are aſthmatic, or have their lungs otherwiſe weak, are liable to be affected by changes of weather. *Monſieur de la Condamine* tells us, that the Spaniſh and French academicians, who were appointed to meaſure a degree of the meridian near the equator, on aſcending the very high mountains of *Quito*, found themſelves ſo much incommoded by the lightneſs of the atmoſphere, as to have violent pains in the internal ear, and diſcharges of blood from their lungs. As the mercury of the barometer ſtood then at 16, the weight of the atmoſphere was leſ-

ſened

ſened nearly 1500 pounds; and the reſiſtance to the propulſive power of the heart being ſo much diminiſhed, the blood was forced through the arteries into the air-cells of the lungs; and the air of the internal ear was very much rarefied. *Da Coſta* experienced the ſame effects, but in a higher degree, when he croſſed the *Andes* ſome years before. Some experiments made in air-balloons ſeem to confirm theſe inſtances of inconvenience from breathing in higher regions of the atmoſphere.

The vivifying principle of the air has been ſuppoſed to depend on its elaſticity; and that in air unfit for breathing the elaſticity is much leſſened; but this is not the ſole cauſe; for though the fumes of burning ſulphur, charcoal and candles, the vapours of fermenting liquors, the inflammable air diſcharged by heated metals, the damps of mines, the effluvia of paints, the putrid exhalations from animals and vegetables, ſtrong odours or perfumes, and even the breath and perſpiration of perſons crouded in rooms not duly ventilated, diminiſh the elaſticity of the air; yet this is rather an accidental effect than the true cauſe of its being unfit for breathing. It ſhould ſeem that the noxious effects of air, impregnated

nated with theſe vapours, proceed from their being ſo ſaturated with mephitic matter as to be unable to combine with and carry off the noxious matter generated in our bodies; and partly from their ſedative qualities, inducing a kind of paralytic weakneſs of the nerves of the lungs.

Infant man does not breathe before his birth.

The only organ contained in the cavity of the breaſt beſides thoſe already deſcribed, is the *Thymus* gland, the uſe of which is not well known: it is largeſt in the infant, and gradually decreaſes in ſize. The cavity of the breaſt is pretty nearly divided into two equal portions by a double membrane, which extends from the ſpine to the breaſt bone; ſo that the right lobe of the lungs is ſeparated from the left by this membrane.

§. 58. *The Voice*, or *Articulation.* The upper part of the larynx has ſeveral ſmall muſcles contiguous to that opening through which the air paſſes into the lungs: by theſe muſcles this chink or aperture is enlarged or contracted, ſo as to produce the various gradations between the moſt grave and acute tones.

tones. The tongue, palate, lips, and teeth, contribute very conſiderably to modulate the voice.

The *Glottis* is the chief inſtrument of the voice, which is uttered by the tremulous vibrations of the ligaments of this curious aperture; the larynx being elevated in acute ſounds, and depreſſed when grave ſounds are uttered. There are many curious circumſtances reſpecting the voice, its tones, and modulations, and the pronunciation of letters and words, which my neceſſary brevity obliges me to omit.

The human voice is far ſuperiour to that of other animals, and to the moſt perfect muſical inſtruments, not only in diverſity of tones, but in melody.

We are as much diſtinguiſhed from each other by difference of voice as of countenance; and various uſeful purpoſes are anſwered by theſe ſtrong marks of diſtinction between man and man. Some perſons are endued with a faculty of throwing their voices into particular directions; and hence various ludicrous incidents and miſtakes from the exerciſe of this art by *ventriloquiſts*.

§. 59. *Morbid*

§. 59. *Morbid Affections of the Vital Powers.* In conſidering this very extenſive and intereſting ſubject, I find it difficult to draw a line between that prolixity which would be inconſiſtent with my plan, and that extreme brevity which muſt neceſſarily leave the curioſity ungratified, and the philoſophical principles not ſufficiently explained.

Theſe morbid affections ought, for the ſake of perſpicuity, to be arranged under different heads.

1ſt. All the organs of vital motion, compoſed as they are of ſimple cellular and muſcular fibres, muſt be liable to all the affections enumerated §. 4.

2dly. Animated as theſe ſimple fibres are by an intermixture of nerves, which impart the faculty of ſenſation and power of motion, we may eaſily conceive that they muſt be ſubject to all the nervous affections enumerated under §. 9, and to thoſe of the muſcles, §. 12. But as many of the organs of circulation and reſpiration are cavities and tubes of different dimenſions, and adapted to various purpoſes, they muſt, as ſuch, be ſubject to manifold deviations from the healthy ſtate, in conſequence of various faults of their natural

tural ſtimuli, from their becoming preternatural or morbid.

To explain theſe to any but medical readers is very difficult; becauſe the names of the diſeaſes which ought to be adduced as the ſtrongeſt examples, are not familiar to any others: I ſhall, however, ſelect ſuch as are moſt intelligible.

3*dly*. All the organs of the body may be *conſtitutionally* weak; and hence it is that perſons of delicate habits are ſeldom well, becauſe the œconomy of their health is diſturbed by very ſlight cauſes: or the body may be weakened by former diſeaſes; and therefore it is that perſons who have been ill of fevers, convulſions, or other diſeaſes, are very apt to relapſe before their healths are perfectly re-eſtabliſhed.

4*thly*. The natural ſtimulus may diſturb a ſound body by its bulk ſtimulating the heart too much; as when young perſons full of blood are ſhort breathed on exerciſe: or by its pungency; either in conſequence of heat, as when the blood is over-heated by violent exerciſe, ſtrong drink, &c. as will be farther explained under *Morbid progreſſive Motion*; or by its qualities being depraved by

infection or acrimony; as when gouty matter, repelled from the foot, falls upon the heart, lungs, &c. as will be explained under *Morbid inteſtine Motion.*

5thly. Some part of the natural ſtimuli may be ſo groſs as to plug up, as it were, ſome of the cavities; as happens from congealed blood, or rather ſerum or lymph producing polypuſes in the cavities of the heart, lungs, and large blood veſſels—ſhortneſs of breath and cough from groſs phlegm in the air-cells of the lungs; or a particular kind of aſthma of ſtone-cutters, from the particles of ſtone inſpired by the lungs.

6thly. The cavities, whether previouſly weak or not, may be burſt, either by the quantity, or the forcible motion, of the natural ſtimuli: Thus his late Majeſty expired inſtantly from a burſting of one of the cavities of the heart; ancuriſms of large arteries have alſo burſt, and deſtroyed the patient; and the ſmaller arteries may either be rent aſunder in their ſides, or their orifices forced open, and the blood diſcharged. Hence various diſcharges of blood from the lungs, noſtrils, ſtomach, bowels, kidneys, &c. beſides various diſcharges of blood into the

cavities

cavities of the head, breaſt, and belly, from whence there are no outlets.

7thly. Theſe organs may alſo have their ſtructure much injured by hard bruiſing inſtruments; and hence very dangerous diſeaſes, and ſometimes ſudden death, from ſevere blows on the head, breaſt, &c. the effects of which may, in ſome degree, be exemplified in a common bruiſe on the ſurface of the body, where, from the dark colour of the bruiſed organ, it is evident that a conſiderable number of ſmall veſſels have been burſt, and the blood effuſed under the ſkin.

8thly. The organs may have their ſtructure deſtroyed by wounding inſtruments; and the nature of ſuch an injury ſuſtained by the heart, lungs, and other great organs, in which it is generally fatal, may be eaſily conceived from the appearance of a wound in one of the limbs.

9thly. They may alſo have their ſubſtance partly deſtroyed by ſharp or corrupted matter lodged upon them, in conſequence of inflammation, bruiſe, wound, or burſting of blood-ve els, as may be ſeen in external ulcers or ſores of any kind: Hence the ſubſtance of

the heart has ſometimes been found ulcerated; and ulcers of the lungs, commonly called *conſumption*, ſometimes occur from inflammation of that organ, ſpitting of blood, &c. and the ſame happens from ſimilar cauſes in the ſtomach, inteſtines, kidneys, &c.

10*thly*. The natural ſtimulus may be ſo deficient in quantity as not to excite the organs ſufficiently for a vigorous and ſteady performance of their functions: hence a ſenſe of ſinking, languor and faintneſs at the heart, in conſequence of large evacuations of blood or other humours; in which the lungs partake ſo much, as that a perſon ſcarcely breathes at all during a ſwoon: hence alſo the ſenſe of weakneſs about the heart, in perſons who have long been in a bad ſtate of health, as is evident from the weakneſs of the pulſe, which ſhews that the circulation is very languid, from the blood being not in ſufficient quantity to diſtend and ſtimulate the heart.

Before I proceed, I ſhall offer a remark on what are by ſome ſuppoſed to be two great cauſes of nervous affections; and which would have been premature, when treating of theſe morbid affections §. 9, and 12.

That

§. 60. That the nerves may perform their offices properly, it is neceſſary that they ſhould be preſerved in a due degree of what may be called *tenſion*; that is, that they ſhould be ſo ſupported by the cellular membrane, the muſcles and blood veſſels, and the coats of the hollow organs, as to be kept gently on the ſtretch. I would not infer from this term, that they are elaſtic in any great degree, like muſical cords; but perſons who are ſubject to nervous complaints often expreſs their ideas of their feelings, by ſaying that their nerves are *wound up* to a diſagreeable pitch; or that they are, on the contrary, *unſtrung*; though the analogy is not ſtrictly accurate.

Beſides many other examples of *over-tenſion*, which might be given, I ſhall only mention one.—A patient of mine was ſubject to epileptic fits, brought on by intemperance: ſo long as he lived temperately, he had no fits; but they returned when he exceeded either in eating or drinking, or was diſturbed by paſſion. Here an accidental fulneſs, either of the whole ſyſtem of blood veſſels, but chiefly thoſe of the ſtomach and head, by overſtretching the nerves, excited the con-

vulſion. On the other hand, we know that when nervous affections are owing to the nerves not being kept in due tenſion, (which is the moſt frequent cauſe) hyſterical and hypochondriacal patients often complain of a ſenſe of hollowneſs, ſinking, and emptineſs; —a moſt diſagreeable ſenſation. I know a hypochondriacal patient, and there are thouſands in the ſame ſtate, who ſuffers exceedingly if he does not eat frequently, or if flatulence wanders from one portion of the bowels to another; or he is ſeized with a ſmall degree of purging: and Baron *Van Swieten* records the caſe of a delicate girl, whoſe nerves were ſo irritable, that they were obliged to ſwathe her from her neck to her toes, for the purpoſe of giving due *tenſion*, firmneſs, or ſupport, to the over-relaxed nerves, and ſupply the defect of that regular tenſion which they have in perſons of a firm ſtate of fibres, ſtrong muſcles, and a ſteady circulation; and it is for this reaſon, probably, that perſons of a firm temperament have ſeldom any exceſs of bodily ſenſibility. From what has been ſaid, we ſee that morbid affections of the nerves may ariſe from two oppoſite cauſes.

And

And now we are on this ſubject, it may be obſerved that perſons of a groſs habit, having a leſs degree of ſenſibility, may be owing to the cellular threads being in them of a groſſer texture than in the delicate temperament, and from oil, or a groſſer ſerum than uſual, being diſcharged into the cellular interſtices, and thereby not only blunting the impreſſions made on the nerves, but ſometimes interrupting the communication with the brain. Of this we have an inſtance of ſchirrous or hard ſwellings of the glands of the breaſt, which, ſo long as they are in that ſtate, are almoſt totally inſenſible; and the ſame happens in the ſtomach, lungs, &c.

§. 61. From what has been ſaid in the preceding pages, it may readily be conceived, that as the circulation of the blood is the great ſource of life; ſo, many important diſeaſes muſt be produced when it deviates from its natural ſtate. This deviation may take place in various ways.

1*ſt*. Its *progreſſive* or direct motion from the heart, through the arteries, to every part of the body, and back again through the veins to the heart, may be *too great*, ſtrong, and

and rapid, of which the ſimpleſt idea we can conceive is what happens to a perſon after running ſome time. The pulſe becomes more quick and full than uſual, he breathes hard, and is hot: that is, he has a fever, which will continue and increaſe ſo long as the exerciſe is continued, and for ſome time afterwards. How are we to account for this change? Simply by ſaying, that, by the ſtrong and quick contractions of the muſcles employed in moving the limbs, the veins which are contiguous to thoſe muſcles being ſtrongly preſſed by them during their contractions, the motion of the blood through the veins is increaſed; more blood than uſual is returned to the heart, and it muſt neceſſarily contract more ſtrongly, or more frequently, or both, that it may empty itſelf as often and as quickly as it is filled; otherwiſe it muſt be, as it were, overflowed, and its motion ſtopped altogether, as is often the caſe with horſes in hunting, which drop down dead; and has ſometimes happened to men during violent exertions. This temporary fever may become a continual and fatal fever; as has happened frequently to perſons who have uſed violent exerciſe.

Here

Here the natural ſtimuli of the heart, the bulk, motion, and heat of the blood, being all increaſed beyond their due proportion, they are converted into morbid ſtimuli. The ſame happens with reſpect to exceſs in the uſe of ſtrong drinks, ſpiceries, animal foods, &c. all of which, as we daily experience, create a fever by the ſtimulus they impart to the heart through the ſtomach, which fever generally goes off in a few hours; but ſometimes becomes a real diſeaſe.

2*dly*. The progreſſive motion of the blood may become too weak, languid, or ſlow, from the power of the heart and arteries being weakened by diſeaſe; and therefore not able to contract with their uſual vigour. This ſtate of the circulation is oppoſite to the former; and ſuch perſons are pale, weak, and languid, and the pulſe is ſometimes ſoft and ſlow, but often weak and quick.

This difference in the pulſe ſhould be explained.

In ſome diſeaſes the body in general has ſo much leſs ſenſibility than it ought to have, that the heart and other organs labour under a kind of palſy; and hence we can account for the pulſe being ſlow; but in general

neral the pulſe, though weak, is quicker than in health, owing to the nerves of the organs being rendered too ſenſible or irritable by diſeaſe; and the heart being in this ſtate, it contracts more frequently to puſh on the blood, becauſe it wants ſtrength ſufficient to diſcharge ſo large a quantity at once as it was wont to do in health. This accounts for the quickneſs of the pulſe; and its weakneſs proceeds either from ſo great a quantity of the blood being exhauſted by diſeaſe, that it cannot fill, diſtend, and ſtimulate the heart as uſual, and perhaps alſo from its not being ſo hot, denſe, and pungent, as in health. (See §. 59, p. 132.)

Hence in this ſtate phyſicians are often obliged to give ſuch medicines, and direct ſuch diet, as may increaſe the natural ſtimuli, or, in other words, produce an artificial fever.

§. 62. *Inteſtine Motion of the Blood.* I hinted, §. 55, p. 110, that ſome phyſiologiſts were of opinion that the ammoniacal ſalt, and the air contained in the blood, produced a kind of fermentative motion between the particles, which conferred upon them a kind of vital principle,

principle, and perhaps contributed to ſupport their heat and fluidity.

This opinion is not improbable; at leaſt ſomething like it takes place in diſeaſe; though the term *fermentative*, borrowed from the working of fermenting liquors, is not accurate; but we are often, from a defect of language, obliged to make uſe of remote analogy. The truth is, that the manner in which ſome of theſe changes are produced is as inexplicable as it is wonderful: I ſhall illuſtrate this matter as ſimply as I can by an example.

A perſon is inoculated with an exceedingly ſmall particle of matter taken from a patient in the ſmall-pox, which is ſucked in or abſorbed by a lymphatic vein, and carried into the blood. What is the conſequence? It is mixed with the whole maſs of blood, and at the end of ſeven or eight days various ſymptoms come on, which ſhew that the nervous ſyſtem and the heart are affected by ſome morbid ſtimulus, and almoſt every organ of the body is diſturbed by nervous and feveriſh commotion.

By what means, or rather, by what change, is this diſturbance in the whole ſyſtem produced?

It ſhould ſeem that the matter, mixing with the whole maſs of humours, imparts to them ſo much of its own nature, as to produce eruptions on the ſkin, ſimilar to thoſe on the perſon from whom the matter was taken. This change we call *aſſimilation*, or a change by which one thing being mixed with another reduces it to its own nature; as a ſmall quantity of yeaſt will ferment a large quantity of wort.

Is the whole maſs changed in the courſe of eight days into a variolous nature? So it ſhould ſeem, from the learned and ingenious Profeſſor *Home* having inoculated a child with the blood taken from another in the meaſles.

It ſhould ſeem, therefore, that a certain ſpace of time is required for the compleat aſſimilation of the blood by the contagion.

In this way only we can account for a contagious diſeaſe being conveyed from a diſeaſed to a ſound organ, by the ſubtle effluvia being ſucked in by the pores of the lungs, and the paſſages into and through the ſtomach, and mingled with the blood; when each ſpecific contagion produces its like, as putrid ſore throat, putrid and malignant fever,

fever, plague, &c. and ſome perſons alledge, that nervous fever, conſumption, and ſome other diſeaſes, are actually contagious.

What is the change actually made on the blood by theſe contagions? In ſome inſtances none that is diſcernible; in others, the texture of the blood ſeems to be broken down and diſſolved, as in putrid fevers.

In theſe caſes, as in the ſmall-pox, a longer or ſhorter time ſeems to elapſe from the inſtant of receiving infection, to the time of its breaking out in the form of diſeaſe; though if we may credit ſome accounts of the inſtant fatality of the plague, it ſhould ſeem that theſe infections may act, as it were, inſtantaneouſly on the nervous ſyſtem, and extinguiſh life with the rapidity of lightning.

The phyſicians of the laſt age conceived that many of our diſeaſes aroſe from the blood being tainted or *aſſimilated* by admixture of bad foods and drinks; and that thereby various kinds of acrimony, ſcrophulous, ſcorbutic, putrid, gouty, &c. were generated. As the inteſtine motion may be too great, and increaſe the pungency and perhaps the heat of the blood; it has alſo been ſuppoſed that it may be deficient, and

produce

produce a crude, cold, watery, and inert ſtate of the blood, and thereby contribute to defective progreſſive motion. On this ſubject I ſhall make ſome remarks in the next book.

§. 63. *Morbid Determination.*[h] I have remarked, §. 48, that as an equal diſtribution of the blood to every part of the body is a moſt eſſential cauſe of health; ſo, when in the courſe of circulation, too much or too little blood is tranſmitted by the arteries

[h] Though the doctrine of Derivation and Revulſion, as neceſſarily implying morbid determination, has long been applied to practical purpoſes in the cure of diſeaſes, or the mitigation of particular ſymptoms; yet, ſo far as I recollect, the principle of morbid determination has not, except by myſelf in a former work,* been formally and pointedly adopted, either for the purpoſe of explaining many phœnomena in diſeaſes, or as a ground for indications of cure; and I flatter myſelf that, by the extenſion of this principle, I have rendered this very extenſive branch of pathology much more ſimple and intelligible than it has hitherto been; and the more this principle is examined by judicious readers, they will find it to be exactly conformable to many important indications for the cure of a great variety of diſeaſes; and every man who practiſes on a rational plan will readily allow, that, provided principles are well grounded, the fewer and more ſimple they are, the danger of making erroneous inferences will be diminiſhed, and the certainty of ſucceſs in the management of diſeaſes will be proportionably increaſed.

* Commentaries on the principles and practice of Phyſic, which has been long out of print.

to any particular organ, many very dangerous diſeaſes may be produced.

From what has been ſaid on the ſubject of progreſſive motion, it may eaſily be conceived, that when it is too violent, as in fevers, the blood cannot be equally diſtributed; hence the great flushing of the face under violent exerciſe and high fevers; on the other hand, when progreſſive motion is weak, determination muſt be irregular; an inſtance of which we have in dropſical and other cold ſwellings.

The proportion of blood ſent to each organ does not ſo much depend on its bulk, as on its peculiar ſtructure, nature, and functions.

Thus the lungs, though not equal in bulk to one-ſixth part of the body, circulate as much blood in the ſame ſpace of time as all the reſt of the body; and Baron *Haller* computes that the brain receives one-third of the whole maſs of humours, though its bulk is only one-eighth of the whole body. It has been already obſerved, that the blood does not flow with equal force or velocity to every organ.

Morbid determination may be owing to leſſened or increaſed proportion of blood ſent to each organ; and this may be either ſudden or ſlow: I ſhall make a few remarks on determination ſuddenly diminiſhed or increaſed under this ſection, and ſhall reſerve my obſervation on the other ſpecies for the next book.

Suddenly diminiſhed determination is a very frequent and powerful cauſe of diſeaſes.

To underſtand how this happens, it ſhould be obſerved, that, as all the veſſels which circulate the blood conſtantly accommodate their cavities to their contents, ſo as to be always full; therefore, ſhould any conſiderable number of thoſe veſſels ſuddenly contract, or leſſen their cavities, ſo as not to admit their uſual quantity of humours, all the arteries between theſe obſtructed veſſels and the heart muſt have more blood in them than is natural; they muſt be overfilled, and in a ſtate of morbid tenſion.

Let us now take a familiar example to ſhew what will be the conſequences.

A perſon is expoſed to rain or cold wind; what will enſue? It is probable that not only the open mouths of myriads of perſpiratory arteries

arteries which open under the ſcarf ſkin, and into the air-cells, and are conſtantly pouring out a fine fluid, will be ſhut up; but thoſe veſſels may, for a conſiderable depth beyond their orifices, and nearer to the heart, be ſo narrowed or conſtricted in their cavities as to allow very little, if any, of their humours to paſs through them. The progreſſive motion of the blood being thus checked in an infinity of ſmall arteries, and the blood continuing to flow into the heart from the veins, this grand organ muſt either be ſo diſtended by the returning blood, as to be totally unable to contract, and death muſt enſue; or it muſt act with redoubled force and frequency, not only to puſh on the blood in its cavities, but to overcome the reſiſtance in the conſtricted arteries; or, in other words, produce a fever. How may this ſtruggle of the heart to reſtore the balance of circulation terminate? In various ways. Either the conſtricted veſſels may be forced open, and, perſpiration being reſtored, the circulation become free; or if the reſiſtance be ſo great as not to be overcome, the tumultuous torrent may be *determined* on the membranes of the noſe, throat, and wind-pipe,

and produce a thin diſcharge from their perſpiratory veſſels, which is vulgarly called a *cold*; or the perſpiratory veſſels of the lungs being more yielding than thoſe of the ſkin, may empty themſelves very copiouſly, as it were by a ſweat; or the ſurcharge of humours may be thrown on the kidneys, or bowels, and be carried off by increaſed ſecretion of their fluids.

In one or other of theſe ways the conſtitution may relieve itſelf, and the tumult neceſſarily ceaſes; when the veſſels of the ſkin at length relax, and compleatly reſtore the equilibrium.

This leads to the conſideration of

§. 64. *Fever*, the nature of which will not now require much explanation. We have ſeen that ſuddenly diminiſhed determination may produce different kinds of ſuddenly increaſed determination; and we proceed to ſhew in what way it may produce others.

If the patient be not relieved in any of the ways juſt mentioned, *the fever is formed.* We know from experience, that if the ſuddenly diminiſhed determination is conſider-

able,

able, the conſtriction of the veſſels, which is a kind of nervous ſpaſm, generally produces an ungrateful ſenſation in the nerves of the obſtructed veſſels, called rigor, chill, or a ſenſe of cold; and ſome are of opinion, that this is the commencement of every fever. Within a ſhorter or longer ſpace, the chill is ſucceeded by a ſenſation of heat; the pulſe quickens and becomes more full; painful ſenſations are excited in different parts of the body, and the patient becomes reſtleſs, watchful, and thirſty.

This is a plain deſcription of a ſimple fever. What may be the iſſue of this fever? After a few days, in conſequence of the repeated efforts of the heart, it may be terminated ſafely by an increaſe of perſpiration into ſweat; or by ſome of the diſcharges from the lungs, bowels, or kidneys, being increaſed; or by a bleeding from the noſe.

But if it does not end ſoon in one or other of thoſe ways, the danger increaſes hourly; and the force of the circulation is diverted from thoſe outlets which the efforts of the heart could not open, upon ſome of the nobler organs, *eſpecially the brain*, where a dangerous and often fatal change may be

produced, the nature of which will be explained under inflammation.

Let us ſuppoſe now, that inſtead of the veſſels being conſtricted by cold, this effect were produced by the ungrateful ſtimulus of ſome one or other of thoſe contagious effluvia mentioned under the ſection of inteſtine motion; a ſimilar febrile ſtruggle takes place; but from the noxious quality of the cauſe, the nervous ſyſtem and vital powers being very much and ſuddenly weakened by the poiſon of the malignant or putrid matter, the conſtitution is leſs able to relieve itſelf; and the diſeaſe often becomes fatal, either by morbid determination on ſome of the chief organs, or by deſtroying the vital and nervous energy.

Many of theſe infectious fevers, beſide ſmall-pox and meaſles, have a tendency to the ſurface of the body, in the form of eruptions, as St. Anthony's fire, ſcarlet raſh, miliary raſh, purples, carbuncles, &c. and much of the danger conſiſts, either in the conſtitution not being able to give the poiſonous matter a determination to the ſurface, or from its falling back again upon ſome of the principal or vital organs.*

* See next Eſſay near the end.

I ſhall conclude this ſection by ſome remarks on the different types and periods of fevers.

The moſt ſimple fever is that of a few hours, when the conſtriction is not great, and is therefore eaſily overcome.

The next in degree of mildneſs is the intermittent, or ague; when, after a few hours, the fever goes off, and returns at ſtated periods.

If the fever does not totally intermit, but only abates, it is called a remittent; and ſo univerſally prevalent is this tendency, that there is no fever, the intermittent excepted, that does not remit at one time or other in 24 hours, but generally in the morning.

Another diſtinction of fever is its being high or low; that is, inflammatory or nervous; but there are various degrees between theſe two extremes, which none but the judicious phyſician can diſcern. Of the nervous there ſeems to be two kinds diametrically oppoſite to each other: one in which the ſenſibility is extreme; another in which the patient ſeems to lie in a ſtupid or apoplectic ſtate from the beginning to the end: The latter is not ſo frequent as the former;

but it is apt to change into it, when it becomes dangerous or fatal.

Fevers are apt to change their nature; that is, the inflammatory may become nervous or putrid, the intermittents may become remittent, or the remittent may intermit.

There are many other curious and intereſting circumſtances reſpecting fevers, which I cannot enter upon.

§. 65. *Inflammation.* After what has been ſaid under the foregoing ſections, this moſt important morbid affection will not require a very diffuſe explanation, if ſufficient attention has been paid to what I have remarked on the manner in which the minute arteries correſpond with the veins.

The red arteries, after ſending off their blood into red veins, ſend off ſerous arteries, which ſeparate a humour thinner than the blood, and of a yellowiſh colour.

The ſimpleſt mode of explaining it, is to derive the information concerning its nature from the appearance and progreſs of a boil, or a whitloe; which every old nurſe pretends to underſtand; but of which they really know nothing.

A ſwelling

A ſwelling appears, which is red, hot, and painful: How do we account for theſe circumſtances? The current of the blood may be determined on the red veſſels of the part, by any cauſe which ſtimulates thoſe red veſſels to contract more forcibly on the blood they contain. What that cauſe is, it is not always in our power to explain, though the fact is indubitable. What happens? The red arteries act more violently than in health, in ſo much that the irritation forces more blood towards the veins than they can receive readily, ſo that not only more ſerum, but ſometimes particles of red blood, are forced through the lateral veſſels into the ſurrounding cellular membrane, by their mouths which open into it. Hence we can account for the ſwelling, the redneſs, and the pain. After this mixture of blood and ſerum has ſtagnated there ſome time, what is the event? It is various: ſometimes theſe fluids are ſucked up by the veins, and carried into the circulation, and the boil gradually becomes leſs ſwelled, red, and painful, and at length diſappears; more frequently by ſtagnation and heat, the fluid is converted into matter, and is diſcharged; and, though rarely,

rarely, the nerves and blood-veſſels are ſo compreſſed and ſuffocated, as it were, by the quantity or ſharpneſs of the matter, that they loſe all ſenſation and motion, and the part becomes gangrened or mortified.

What happens to an inſignificant ſwelling, the progreſs of which is obvious to the ſenſes, happens to the heart, lungs, and every other internal organ; and the judicious reader need not be told that, on account of their ſize, ſituation, and great importance, the danger muſt be proportionably greater.

It is worthy of obſervation, that even a whitloe, or a number of boils, ſhall, by ſympathy, extend the painful ſtimulus to the heart, and produce fever; how much more ſevere therefore muſt that fever be, which is excited by inflammation of a large and very ſenſible organ?

Inflammation, therefore, may either begin in a particular organ, as in the inſtance now given; or it may be an effect of morbidly increaſed determination upon one or more organs, in conſequence of any or all of the kinds of fevers mentioned above; and which, as I remarked before, is the chief cauſe of their danger and fatality.

§. 66. *Hæmor-*

§. 66. *Hæmorrhage*, or morbid diſcharge of blood, forms a moſt important claſs of diſeaſes.

1*ſt*. It may proceed from wounds or bruiſes. (See §. 59, No. 7, p. 131.)

2*dly*. The arteries may be ſo tender and weak, and their orifices or open-mouths ſo much relaxed and widened, as to allow the blood to run through them: Hence the blood is diſcharged from the noſe or lungs of very weak perſons; and generally ſo thin and watery, as ſcarcely to tinge a white handkerchief.

3*dly*. In putrid fevers, and ſea-ſcurvy, the blood is ſometimes ſo melted down, as to ſettle under the ſkin in purple ſpots; and to be diſcharged from the lungs, ſtomach, bowels, ſkin, and *even* from the corners of the eyes.

4*thly*. But the moſt frequent and dangerous is that which proceeds from increaſed determination and fever, the conſequence of ſuddenly diminiſhed determination in ſome other part of the body; as in apoplexy, ſpitting of blood, dyſentery, &c.

§. 67. The

§. 67. The muſcles and membranes of the larynx are ſubject to all the diſeaſes of other organs, §. 4, 9, 12, and conſequently may be relaxed, conſtricted, inflamed, &c. by which the voice may be variouſly affected, or totally loſt.

Perſons born deaf, cannot articulate words, unleſs inſtructed; and even then their voice is harſh and monotonous, as it cannot be regulated by the ear.



BOOK IV.

Of the Natural Functions.

Chap. I.

Of the Natural Functions—Organs of Maſtication—Deglutition—Stomach—Digeſtion—Experiments on the Digeſtion of Brutes—Cauſes of Digeſtion—Inſtances of extraordinary Appetite—Hunger—Inſtances of extraordinary Faſting—Thirſt—Inſtances of the fatal Effects of Thirſt—Changes of the Food in the inteſtinal Canal—its converſion into Chyle.

§. 68. THE *Natural Functions* are various; for beſides thoſe which are enumerated in the contents, the ſecretions and excretions are alſo natural functions, and will be conſidered in the next chapter.

As the body is conſtantly undergoing a waſte of its ſolids and humours in conſequence of the neceſſary exerciſe of its functions;

tions; it is indiſpenſibly neceſſary that this expence ſhould be ſupplied in a degree adequate to the waſte. This ſupply is afforded by *aliment*, or meats and drinks.

§. 69. The ſolid parts of our foods ought to be divided, not only for the purpoſe of ſwallowing them with more ſafety, but that they may be more eaſily prepared into nouriſhment by the digeſtive powers.

Maſtication is performed by the *teeth*; which when they are compleat, are ſixteen in each jaw, fixed firmly into bony ſockets, and ſupported by the gums. Each tooth is ſupplied with an artery, a vein, and the branch of a nerve.

The teeth being of different forms, ſome are fitted for dividing, others for grinding ſolid foods; and they are better ſuited for theſe purpoſes by being covered by a hard enamel.

The lower jaw being ſupplied with a variety of muſcles, they open and ſhut the mouth, and preſs the teeth, in different directions, againſt the ſolid food, which is directed towards them by the lips, tongue, and cheeks, which are ſupplied with muſcles

for

for that purpoſe, and for the modulation of the voice.

§. 70. *Deglutition.* During *maſtication*, the food is ſoftened by the *ſaliva* and other fluids, to be taken notice of hereafter, and being reduced into a ſoft pulp, is thruſt over the tongue into the *pharynx*, or gullet. It is prevented from entering the larynx, by the *epiglottis*, which covers that paſſage; and cannot paſs into the noſtrils, the opening into which, from the throat, is at that inſtant ſhut up by the veil of the palate. It happens however, from a defect of thoſe organs, or want of caution, that ſome portion of food or drink does deviate into one or the other, by which ſome inconvenience, and even danger, may be incurred.

The *Pharynx*, or gullet, is a membranous bag placed behind the larynx, which is ſupplied with muſcles to direct and preſs the food downwards into the *œſophagus*, which is a tube which, paſſing down the back part of the breaſt, and through an opening of the midriff, is expanded into the *ſtomach*, which is extended acroſs from the left ſide beyond what is called the pit of the ſtomach. To

the

the ſtomach, at its right end or orifice, is joined a long canal or tube, which, by a number of turnings and convolutions, occupies a very conſiderable part of the cavity of the *abdomen* or belly, and terminates at the lower part of it. The *inteſtines*, though a continued canal, have been divided by anatomiſts into ſix portions, to each of which they have aſſigned a name.

The *Stomach* and *Inteſtines*, by means of their muſcular fibres, perform a gentle wave-like motion, called *periſtaltic*.

Man, and carnivorous animals in general, have but one ſtomach; in ſome of the ruminating animals there are four ſtomachs; and in others, and in many birds, there are three; others, as the eagle and other carnivorous birds, have but one; as alſo the horſe, elephant, &c.

This continued canal, extending from the throat downwards, is nearly of a ſimilar ſtructure, conſiſting of ſeveral layers of membranes interſperſed with muſcular fibres, and ſupplied with nerves, arteries, and veins; and many of the finer arteries, opening into the cavity of the whole canal, are conſtantly pouring out a fine fluid called the *gaſtric* and *inteſtinal lymph* or juice.

§. 71. *Digeſtion.* When the aliments and drinks arrive at the *ſtomach*, they, by their bulk, weight, and other qualities, ſtimulate the nerves and ſmall veſſels, which are thereby excited to pour out the humours more copiouſly; whilſt the aliment undergoes a gentle agitation, by the united means of the periſtaltic motion of the ſtomach and bowels, and the action of the intercoſtal and abdominal muſcles in reſpiration.

To theſe agents of digeſtion, we muſt add the natural heat of the body, equal to 96 degrees, by which the air contained in the alimentary maſs is extricated, and breaks the texture of the ſolid foods; whilſt the ſaliva, which is ſwallowed with the food, contributes its ſhare in compleating the proceſs, ſo far as reſpects the ſtomach; for the inteſtines have a very conſiderable ſhare in preparing and aſſimilating our foods to an animal nature.

I proceed to make ſome remarks on the important function of *digeſtion*.

Our foods and drinks, together with the ſaliva and gaſtric juice, are the natural ſtimuli of the ſtomach; and it is evident that their quantity and qualities ſhould be ſuch,

as

as that their ſtimulus ſhall neither exceed, nor be deficient, for the purpoſe of perfect digeſtion.

Various opinions have been held concerning the nature of digeſtion. The mathematical phyſiologiſts attributed it chiefly to the muſcular power of the ſtomach and the abdominal muſcles, which they eſtimated at many hundreds of pounds; but the calculations were erroneous.

It is certain, however, that the contractile power of the muſcular coat of the ſtomach is conſiderable. The upper and lower orifices certainly contract ſo cloſely as not to allow the thinneſt liquid to paſs; and even the middle portion of that organ contracts its diameter to the quantity of its contents, and aſſiſts in diſcharging them upwards or downwards. Some foods are retained longer in the ſtomach than others; and in Eſſay III. ſome account will be given of the relative digeſtibility of foods. In general, the ſtomach is empty at the end of the ſeventh hour after eating; and we judge of the emptineſs of the ſtomach from the return of hunger: the *Mexicans* digeſt more rapidly, for they are in danger of fainting if they faſt more

more than three hours after a meal: ſome perſons of rapacious appetites have, on diſſection, been found to have ſtomachs of a ſmall ſize, and which therefore became ſooner empty.

From ſome experiments made out of the body, it is inferred, that digeſtion is performed by a fermentation not very different from that by which wines and beers acquire their intoxicating quality, and that during this fermentative proceſs a conſiderable quantity of fixible air is ſeparated from the aliment, which in its eſcape contributes to the ſolution of the other principles of which it is the chief cement; but is again partly united with them before they mix with the blood. It is ſuppoſed that when the digeſtive fermentation is perfect, it is *vinous*, or of the nature of wine; when imperfect, the contents of the ſtomach become ſour or acetous, or alcaleſcent or tending to putrefaction.

It is certain that, in ſome other animals, the food has a ſtrong diſpoſition to aceſcency; and from Sir *John Pringle*'s experiments, it appears that animal foods readily ferment with ſaliva; to which we may add, that both iron and braſs have been corroded in the

human ſtomach, owing, it is ſuppoſed, to an acid generated there: In man ſometimes, and generally in carnivorous animals, the contents of the ſtomach acquire a putrid nature. Thus in a man whoſe ſtomach retained the food for twenty-four hours, and rejected it by vomit, it was found to be quite putrid; and the breath of the lion, eagle, hyæna, and other carnivorous animals, ſeems to approach to a putrid nature. This opinion of food, even vegetables, putrifying in the ſtomach is very ancient, and was held even by *Hippocrates*; and it was generally, but erroneouſly, deemed a neceſſary part of the proceſs of digeſtion; for I believe it never takes place to any conſiderable degree in the healthy ſtate of the ſtomach.

It is an extraordinary fact, that not only the human ſtomach, but thoſe of brutes, abſolutely ſometimes generate a vapour which will take fire, as in two inſtances of oxen; and in a woman diſſected by *Ruyſch*, a vapour iſſuing from the ſtomach caught fire when a candle was brought near it. In dram-drinkers the breath is ſaid to take fire ſometimes; and an Italian Counteſs is ſaid to have been totally conſumed, one hand excepted,

excepted, in conſequence of drinking inordinately of ſpirit of wine.

From ſome later experiments, however, made on man and other animals, it appears that this doctrine is not ſtrictly juſt, when applied to healthy digeſtion; and as it may amuſe the reader, I ſhall give a brief detail of the reſult of thoſe experiments by which a more exact idea of the general nature of digeſtion may be obtained.

1*ſt*. In ſuch of the bird kind as have gizzards, digeſtion is performed by the muſcular force of the ſtomach, which is very great.

2*dly*. In the birds which have membranous ſtomachs, and live on inſects, and in beaſts of prey, digeſtion is chiefly performed by the gaſtric juice.

3*dly*. In ruminating animals, as the ox and ſheep, the food, after being ſome time in the ſtomach, is thrown back into the mouth, and undergoes a ſecond maſtication, and is afterwards digeſted by the humours of the ſtomach.

4*thly*. Animal food is not digeſtible by thoſe animals which live ſolely on vegetables; nor vegetables by thoſe whoſe natural food

is of the animal kind; but ſome domeſtic animals, as the dog, hog, and duck, can digeſt both.

5thly. The human ſtomach, when in a healthy ſtate, digeſts both, but without any fermentation; and the gaſtric juice has a power of correcting and reſiſting both acidity and putrefaction; and though the inner coat of the ſtomach in man and all other animals has a peculiar power of curdling milk, yet this does not ſeem to proceed from an acid; and from ſome experiments it ſeems to be rather of an alcaline nature.

The quantity of gaſtric juice diſcharged into the ſtomach is very great: it has ſometimes been diſcharged from the ſtomach by vomiting to the quantity of three and even five pounds, and in one patient ſixteen pounds were diſcharged in the courſe of a few hours.

Even whilſt the food continues in the ſtomach, ſome of the finer parts of it are carried into the circulation, and nouriſh the body. Of this we have undoubted proofs, not only from hungry perſons being invigorated ſoon after the food is received into the ſtomach; but from what has happened in ſome deplorable and incurable diſeaſes of the ſtomach.

Thus

Thus of two perſons, the lower orifices of whoſe ſtomachs were entirely contracted by a ſchirrus, and who conſequently vomited up their food again; one ſurvived eight years, and the other twenty, in this ſtate.

It appears, therefore, from what has been ſaid concerning the proceſs of digeſtion in the healthy, and even in the diſeaſed ſtomach, that the gaſtric humour is not the ſole agent in digeſtion; but that it is aſſiſted by the ſaliva, and even by the mucous or ſlimey matter, which is ſeparated by the glands of the ſtomach, to defend its nerves from being too much irritated by any matter we may ſwallow; and by the contractile force of the ſtomach, which is not inconſiderable;—that the ſaliva is peculiarly uſeful, and therefore thoſe who expend it either by chewing or ſmoking tobacco, injure the digeſtive powers of the ſtomach very much; and that an acid never does prevail in a healthy ſtate of the human ſtomach. From the highly diſſolvent nature of putrefaction, it is not however improbable, from ſome experiments, that a change of the food, approaching ſomewhat to putrefaction, may take place *even* in the ſtomach, but more compleatly in ſome por-

tion of the inteſtinal canal, eſpecially after the digeſtion there has been compleated; and if to theſe we add the moderate degree of 96 degrees of heat, we have all the probable cauſes of digeſtion united, ſo far as depends on the ſtomach.

So exquiſitely ſenſible is the ſtomach, that ſome authors have conſidered it as the ſeat of the ſoul. *Van Helmont* placed the ſoul in the upper orifice of the ſtomach; and ſome others have ſuppoſed it to be the great center of ſympathetic communication between the different organs of the body.

Some perſons have enormous appetites: the Roman emperor *Maximin* could, it is aſſerted, eat 20 lbs. at a meal, and his muſcular ſtrength was in proportion. The noted ſtrong man of *Iſlington* required thrice the proportion of food neceſſary for an ordinary man. But this is not always the caſe; for I have known ſeveral very ſtrong men whoſe appetites were very moderate.

Sanctorius, an Italian phyſician of the laſt century, diſcovered by experiments that there was an intimate connection between digeſtion and perſpiration, as I ſhall explain more fully in the next chapter, and in the Eſſay on Regimen of Diet.

§. 72. *Hunger* is a painful ſenſation in the nerves of the ſtomach, produced, as ſome think, by the friction of one part of the inner coat againſt another. The Supreme Being has not left the ſupport of life to our diſcretion, but has implanted in us appetites, which, by the intolerable feelings they excite, force us to procure the means of allaying them.

The waſte of the body of a middle-aged man in twenty-four hours, is ſuppoſed to be nearly equal to ſeven pounds, therefore it is neceſſary that the ſupply ſhould be in proportion, a conſiderable part of which ought to be drink.

Of thoſe perſons who have died of hunger, the youngeſt and moſt robuſt have periſhed ſooneſt. The ſons of the *Count Ugolini*, who were ſtarved to death in priſon at Piſa, died the fifth and ſixth days, whilſt the Count himſelf ſurvived to the ninth. A woman who laboured under melancholy, and refuſed all food, died the thirteenth day. There are many inſtances of perſons faſting voluntarily for a long time. The *Tartars* often faſt five or ſix days; and there is an order of *Greek* monks who do not eat more than

than ſix meals during the forty days of Lent. Many have ſurvived a conſiderable time on water alone: the inhabitants of Madura faſt for a month at a time; and a perſon in a conſumption lived thirty-five days on water acidulated with a few drops of ſpirit of nitre. *Johanna Naunton*, a young lady of good family, induced by pride to conceal her extreme poverty, lived ſeventy-eight days on the juice of lemons; and we are credibly informed, that a Swiſs lady exiſted four months without meat or drink.

With reſpect to thoſe extraordinary inſtances of perſons who have ſurvived from one to eighteen years without food, and with a very ſmall proportion of drink, this extreme abſtinence can only be accounted for, by obſerving, that they generally laboured under ſome diſeaſes, which weakened the ſenſibility both of body and mind.

§. 73. *Thirſt* is more intolerable and excruciating than hunger. This appetite for drink is excited to force us to take in a ſufficient quantity to dilute our blood. Want of water obliged *Lyſimachus* to deliver up his whole army as priſoners of war; and the

the Emperour *Charles* the Vth loſt almoſt all his army by thirſt in the plains of Africa: the dreadful ſufferings of the Engliſh ſhut up in the black hole in Calcutta are well known.

§. 74. After the aliment has been retained ſome time in the ſtomach, it is gradually preſſed out of the lower orifice of the ſtomach into the inteſtines by the periſtaltic motion; the more liquid parts firſt, and the groſſer laſt, as was remarked in two perſons, who had received wounds which penetrated into the cavity of the belly, by which the contents of the inteſtine connected with the ſtomach were diſcharged. In theſe caſes it appeared that ſome of the leaſt digeſtible parts of the food were detained in the ſtomach from ſix to eight hours, but it has ſometimes happened that particular articles of food have been detained there for many months.

Soon after the aliment arrives in the inteſtinal canal, it is mixed with the *inteſtinal lymph*, the *bile*, and *pancreatic juice*, by which it is farther diluted and animaliſed, by a converſion of the thinner part into a greyiſh fluid called

called *chyle*, which is conveyed into the blood by channels to be deſcribed in the next chapter; whilſt the groſſer part of the aliment being gradually preſſed forward, by the periſtaltic motion, into and through the larger inteſtines, is at length diſcharged.

It appears therefore, that though the term *digeſtion* is commonly applied to the change the aliment undergoes in the ſtomach, yet the inteſtines have a very conſiderable ſhare in that proceſs; nor can it be juſtly ſaid to be compleated until by repeated circulations it undergoes that ultimate change by which it is fitted for performing the office of nutrition; and, being no longer fit for this purpoſe, is diſcharged from the body.

Book IV.——Chap. II.

Of Secretion *and* Excretion.

Nature of the ſecreted Humours—Glandular Organs—their Structure—the Liver and Gall Bladder—Bile—Pancreas and ſalival Glands—Saliva—Meſentery—Lacteals—Chyle—Spleen—Kidneys—Omentum—Milk, its nature and glands—Lymphatic Glands—Mucous Glands—Abſorption—Nutrition—Abſorbent Syſtem—their extenſive uſe explained—Excretion—Organs employed in that function——Perſpiration—Sweat—General Remarks on Secretion and Excretion—Qualities of the Body.

§. 75. SECRETION is that wonderful and very important function, by which certain humours are ſtrained off, or ſeparated from, the veſſels carrying red blood; which veſſels are therefore of a ſmaller ſize and dimenſion than thoſe from which they proceed.

Without entering on a tedious detail of the opinions which have been advanced on this

this ſubject, I ſhall endeavour to give the reader a plain and ſimple idea of the mechaniſm by which this operation of the ſyſtem is performed.

It was remarked, Book iii. chap. 1, §. 49, that the red arteries ſtrained off the ſerum into a ſmaller order of arteries, which might, ſtrictly ſpeaking, be deemed the firſt ſecretion from the blood, but as it is not commonly conſidered as ſuch, I begin with the next order;—and, 1*ſt*, The moſt ſimple and univerſal is, that which is effected by a fine humour paſſing directly through the openings or orifices of theſe ſmall veſſels. Of this kind is the ſecretion of a thin fluid into all the cavities of the body, and even the intervals of each fibre, for the purpoſe of moiſtening them, keeping them ſoft and pliant, and preventing their growing together. This ſimple ſecretion is ſo univerſal, that there is ſcarcely a point in which it does not take place. In this way a fluid is diſcharged into the ventricles of the brain, the noſtrils, the cavity of the mouth and throat, the cavity of the breaſt, the cells of the lungs, the cavity of the pericardium, which covers the heart, the ſtomach, inteſtines,

tines, and cavity of the abdomen, and finally, into all the interſtices of veins, arteries, nerves, and muſcles. It is in this way that the matter of perſpiration is carried off through myriads of extremely ſmall veſſels, which open every where on the ſurface of the body, and the cells of the lungs. *Lewenhoeck*, who was celebrated for his microſcopical obſervations, ſays, that the perſpiratory pores are ſo ſmall that a grain of ſand will cover 125,000 of them.

In the ſame ſimple manner, perhaps, but more ſlowly, the oily part of the blood is ſeparated into the cavities of the bones, into the cellular membrane under the ſkin, and into particular internal organs, where it congeals into the form of fat. *Nutrition* is alſo a ſecretion of this kind.

2*dly*. Certain organs called *glands* have a more intricate and complicated ſtructure, as conſiſting of a number of veſſels convoluted or wound up together; through which the humours paſſing in a ſlow circuitous manner, open at length into one or more cavities, where they depoſit their fluid. In theſe cavities this fluid reſts or ſtagnates, for a longer or ſhorter time, and undergoes various

rious ſurpriſing changes in colour, conſiſtence, ſmell, and other properties, not eaſily to be accounted for, and which certainly has not yet been ſatisfactorily explained.

The moſt celebrated anatomiſts of the laſt century diſagreed in opinion concerning the ſtructure of the glands; but my plan will not permit me to enter into the controverſy.

When the ſecreted humour is of a thicker conſiſtence than the fluid by which it is ſupplied, the thinner part is taken up by ſmall veins, and carried back into the circulation.

The humours ſecreted in this way are, the *bile* by the liver, *urine* by the kidneys, *milk* by the breaſts, the *ſaliva* and *pancreatic juice*, which are humours of a ſimilar quality, by the ſalival and pancreatic glands; the mucous, oily, and wax ſecretions; the tears, &c. by their proper glands. The *brain* has been ſuppoſed to be a gland, deſtined to the ſecretion of the animal ſpirits, diſtributed through the nerves, for the purpoſe of ſenſation and motion; but it remains to be proved that ſuch a fluid really exiſts. See Book ii. chap. 1, p. 15:

I ſhall firſt conſider thoſe glandular organs which miniſter to digeſtion.

§. 76. The *Liver* is a glandular organ of conſiderable ſize, ſeated immediately under the diaphragm, and contiguous to the ſtomach; and lies chiefly on the right ſide. It is ſupplied with an artery for its proper nouriſhment; but it is a ſingular circumſtance, that the blood, from which the bile is ſecreted, is conveyed by a vein, the branches of which being extended through every part of the liver, terminate in ſecretory tubes, which uniting into two canals, one of them conveys the ſecreted bile to the *gall-bladder*, a membranous bag ſituated on the back part of the liver; the other proceeding downward towards the inteſtine, which is connected with the ſtomach, unites with a duct which brings the bile back from the gall bladder, and enters the inteſtine a little below the ſtomach.

It may reaſonably be ſuppoſed, that part of the bile is depoſited in the gall-bladder, and detained there ſome time for the purpoſe of its acquiring ſome neceſſary qualities.

Bile is a fluid of a browniſh yellow colour, of a pungent bitter taſte, and of an oily or rather ſoapy nature; and is diſcharged into the inteſtines of an adult in the proportion of about a pound and an half in 24 hours.

The offices of the bile are ſuppoſed to be various.

By its alcaleſcency (a quality oppoſite to that of acidity, and tending to putrefaction) it corrects the acid tendency of our foods, eſpecially vegetables; and as the humours of our body are ſuppoſed to be of an alcaleſcent nature, it diſpoſes our nouriſhment to acquire the animal nature; it aſſiſts in diſſolving ſuch tough and glutinous parts of our food as have not been ſufficiently changed by the powers of the ſtomach; it blends and unites the oily and watery parts into an emulſion; and it ſtimulates the bowels to propel their contents.

§. 77. The *pancreatic* gland, called in ſome other animals the ſweet-bread, ſeparates a larger proportion of humour than the *ſalival* glands, which are ſituated near, and have ducts opening into the mouth.

The *ſaliva* ſeems to be a mild ſoapy humour, and by that quality contributes to the ſolution of the food, and reſembles the gaſtric and inteſtinal lymph in its nature. The quantity diſcharged from theſe glands is perhaps equal to half the quantity of bile.

By

By theſe united powers our foods and drinks receive their ultimate and moſt eſſential change in the inteſtines, where they are converted into a bland milky juice of a greyiſh colour, called *chyle*.

§. 78. The *Meſentery* is a membranous organ conſiſting of two layers, which on one ſide is fixed to the back, and on the other to the chief part of the inteſtines; this double membrane is interſperſed with a number of glands. Into the cavity of the inteſtines, chiefly thoſe neareſt to the ſtomach, a number of veſſels called *lacteals* preſent themſelves with open orifices, ſuck up the chyle, and convey it along the meſentery to a membranous bag in which the chyle is depoſited, and convey it from thence to a large vein, and from thence to the heart, where it is mingled with the maſs of blood.

The *lacteal* veſſels have valves which prevent the return of the chyle, and conſequently their office is ſimilar to that of the valves of the heart and the veins; they alſo communicate with each other, and with the glands of the meſentery, where the chyle is ſuppoſed to be mixed with lymph. The

lacteals are ſuppoſed to have a power of excluding noxious particles; but this is not always the caſe, unleſs they are very acrid and ſtimulating

§. 79. The *Spleen* is ſituated on the left ſide of the ſtomach. It is divided into a number of cells which receive a conſiderable quantity of blood, which probably undergoes ſome change there; but to what purpoſe is not well underſtood. This organ has been ſuppoſed to be the ſeat of the hypochondriacal diſeaſe, but without ſufficient foundation; for what is vulgarly called the *ſpleen*, is really a diſeaſe of the ſtomach and inteſtinal canal.

§. 80. The *Kidneys* are ſituated near the back bone, and ſupplied with large arteries, which terminate in ſecretory veſſels, by which the watery and ſaline particles, together with ſome of the earthy and oily parts of our ſolids and fluids, are ſeparated, and conveyed by a tube or canal from each kidney into the urinary bladder.

§. 81. The *Omentum*, or cawl, is a double membrane, containing a conſiderable quantity

tity of fat: It descends from the stomach, to the bottom of which it is chiefly connected, and spreading over the intestines, keeps them warm, and interposes a fluid to prevent their growing together.

§. 82. *Milk* is secreted by the glands of the breast. It is chiefly separated for the nourishment of our infant progeny; but this secretion takes place also in young persons of both sexes; nor is it confined to the breasts; for in infants before birth it is found in other glands, which, after birth, are appropriated to other secretions.

Milk, which very much resembles chyle in its properties, contains a considerable proportion of oil and sugar, a considerable proportion of curd, or coagulable matter, and water.

§. 83. The glands not yet described are, —The glands of the eye which separate the *tears*;—those called *lymphatic* glands, situated in the neck, under the arm-pits, and in the mesentery, and various other parts of the body, which convey lymph, and communicate with a particular system of vessels called lymphatic veins, already mentioned;—the

mucous glands, ſituated in the throat, and vulgarly called the almonds of the ears, in the noſtrils, and in the whole tract of the inteſtinal canal from the throat downwards, and alſo in other cavities. Theſe ſeparate a glairy thick fluid, for the purpoſe of defending thoſe cavities from the ſharpneſs or other ſtimulating qualities of their contents; and under this head we may bring the mucous glands of the joints, and thoſe which ſeparate the wax of the ears; and an unctuous matter in ſeveral parts of the ſurface of the body.

There is another ſecretion ſeldom taken notice of, that of *air*, which is probably received in its fixed ſtate; and in that ſtate diſcharged from the lungs by every expiration. In diſeaſe it is certainly ſeparated in an elaſtic ſtate, as in gangrenes and mortifications; but whether this be common or fixible air has not been clearly determined; though moſt probably the latter. Is electric fire to be conſidered as a ſecreted fluid?

Having thus briefly enumerated the glandular organs and their ſecretions, it will be proper to conſider the manner in which the body is nouriſhed; this great purpoſe being effected

effected by a kind of ſecretion: but that this may be better underſtood, it may be right to conſider another operation of the ſyſtem.

§. 84. *Abſorption*, as the term expreſſes, implies the ſucking up of a fluid. The moſt familiar way of explaining abſorption, is by remarking the manner in which a liquid gradually aſcends through the pores of a lump of ſugar placed in it. The aſcent of liquids, in capillary tubes not exceeding a certain diameter, depends on the ſame principle as abſorption. But abſorption is not merely mechanical, for the abſorbents are endued with a living principle, as all other ſenſible and muſcular organs are, ſo that the fluid having once entered their orifices, they, by means of this active principle, promote its progreſs toward the thoracic duct.

§. 85. *Nutrition.* The ſolid parts, even the hardeſt bones, gradually decay, and the particles, thus become uſeleſs, are probably rubbed off by the wave of fluid, conveyed by the arteries, containing particles of nouriſhment, which are deſtined to ſupply their place: ſo that a two-fold change neceſſarily takes place;

the waſted ſolids aſſume, in ſome degree, a fluid form, and are abſorbed by the returning veins; whilſt the liquid particles of nouriſhment ſupply their place, and acquire a ſolid nature.

The fluids of the body alſo become unfit for remaining longer in the body. The oily and ſaline parts become highly alcaleſcent, and almoſt putreſcent, by heat and agitation; and therefore, for the ſafety of the machine, are, together with the uſeleſs ſolids, diſcharged from the body.

This is the moſt ſimple manner in which the function of nutrition can be explained. Some phyſicians have ſuppoſed that nutrition is performed by the nervous fluid; but its exiſtence has been juſtly called in queſtion.

Abſorption is as extenſive as ſecretion; for whereſoever a fluid is depoſited, there muſt be a proviſion made for its being conveyed back again, after it has anſwered the purpoſes for which it was depoſited.

Thus the fine fluid which bedews and moiſtens all the cavities, is abſorbed again, and new fluid depoſited.

Some of the ſecreted humours, as the ſaliva, bile, mucus, wax, and fat, are ſo much more

more groſs in their conſiſtence than the fluids from which they are ſecreted; that we cannot otherwiſe account for this change, than by ſuppoſing that the thinner parts are abſorbed.

Some ingenious arguments have lately been advanced to prove, that the lymphatics and the lacteals are the only abſorbent veſſels; and that the common veins are not abſorbents. The lymphatics are ſuppoſed to convey a fine fluid which is mixed with the chyle in the meſenteric glands.

When the ſecreted humours have performed the various offices aſſigned them, they are abſorbed and mixed with the common maſs of blood.

On the furface of the body, and in the cells of the lungs, an infinite number of veins abſorb the moiſture from the atmoſphere, and with it, probably, ſome of its active principles.

Some of the benefits we derive from bathing ariſe from this abſorbent power of the ſurface: Some perſons have been nouriſhed by an alimentary bath; and various experiments prove that remedies are abſorbed in this way; and the dangerous effects of ſome

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of thoſe applications ſhew how cautious we ought to be in the uſe of them; and how much miſchief may be done by powerful remedies in the hands of perſons ignorant of the human frame. A plaiſter of arſenic applied to a ſcald head killed ſuddenly; and I have known convulſions and death from a quickſilver girdle applied to cure itch. A decoction of tobacco uſed in waſhing the head, brought on vomitting, delirium, and convulſions: a poultice of this plant applied to the region of the ſtomach, produced vomiting, purging, and delirium. White lead applied to cure a ſcurfy eruption, brought on ſhortneſs of breath, vomiting and fainting. In all theſe inſtances the miſchief was done by ignorant old women, and equally ignorant and impudent quacks; for when ſuch applications are made judiciouſly, they are equally ſafe and effectual: Thus a bitter poultice applied to the belly deſtroys worms; flannels dipped in hot brandy allay vomiting; and opium applied externally mitigates pain. I have ſnatched many perſons labouring under fevers and internal inflammations from the jaws of death, by the uſe of the warm bath; and have been equally

ſucceſsful

ſucceſsful in the uſe of it in confluent ſmall-pox, and other eruptive diſeaſes. Much of the benefit derived from the uſe of *our* baths and other mineral waters, ariſes from a very conſiderable quantity, perhaps ſome pounds, being abſorbed, and partly from a grateful and lenient impreſſion of ſenſation excited in the nerves of the ſkin, and communicated by ſympathy to the internal organs. I have cured ſeveral children of agues by a bark waiſtcoat, or a bath made with a decoction of bark.

Hermippus recommends a healthy girl as a bedfellow to an old man; but whatever may be the efficacy of the preſcription, I am convinced that health has been injured by ſleeping in the ſame bed with perſons labouring under diſeaſe; and there is juſt reaſon to believe, that many diſeaſes are contracted by infectious effluvia received by the ſurface of the body, the cells of the lungs, and the paſſage into the ſtomach.

§. 86. *Excretion* is the diſcharge of whatever would, if retained, be uſeleſs or injurious.

As the organs of ſecretion are of various conſtruction, the tubes or excretory ducts which

which carry off the humour which has been ſecreted muſt alſo be different in their conſtruction, diameter, and courſe, but it is not neceſſary to enter into theſe minutiæ in this eſſay.

The chief excretory organs are, the bowels, the kidneys, and the perſpiratory veſſels of the ſkin and lungs. What is uſually called *perſpiration* is a ſubtile and inviſible vapour flying off conſtantly to the amount of ſome pounds daily, as has been found by experiment.

If, for inſtance, we take in eight pounds of meat and drink in a day, five pounds go off by perſpiration: But it is very variable, that eſpecially which flows through the pores of the ſkin, otherwiſe, if health depended on its being always equal, it is ſo liable to be checked by different accidents, that we ſhould not enjoy health for a ſingle day. Some phyſicians have conſidered inſenſible perſpiration as the moſt important of all the diſcharges, whilſt others aſſert that it is not; becauſe there are ſeveral nations that ſtop up the pores by greaſy unctions; but it is not clear that it is much checked by this practice, or the defect may be compenſated by

by increaſed perſpiration by the lungs. We perſpire more during a ſound ſleep than when awake; and as the body is at reſt, the ſecretion is more natural than when we are awake, eſpecially if we uſe much exerciſe, for then the excretion is more groſs and crude, and probably carries off with it ſome of the fine nutritious juices, eſpecially if the perſon ſweats, which is called ſenſible perſpiration, as it comes from the ſame veſſels: ſweat always leſſens the inſenſible perſpiration, and weakens the body more than any other evacuation.

By theſe outlets the particles of worn-out ſolids, and the impure and putreſcent particles of the blood, are diſcharged.

As it is neceſſary that there ſhould be a certain balance or proportion between the ſeveral organs and their natural ſtimuli; if any of the cavities are over-loaded, or the blood-veſſels are too full, the ſuperfluities are carried off either by the natural diſcharges juſt mentioned, or by ſome extraordinary outlet: of the latter, we have an inſtance in bleeding at the noſe, when young perſons are very full of blood.

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An increaſe of one excretion may ſometimes compenſate for a defect of another: Thus when perſpiration is checked, the matter falls on the bowels or kidneys, and thoſe diſcharges are increaſed; and the reverſe. But health cannot be long preſerved under this exchange of evacuations, which is always preternatural, and muſt ſoon produce diſeaſe; becauſe every organ is beſt fitted to prepare and diſcharge its peculiar humour.

It need ſcarcely be obſerved, that beſide thoſe humours which are diſcharged out of the body as uſeleſs and noxious, all thoſe humours which flow from open veſſels into all the cavities, and cellular membrane, in every part of the body, are really excretions; and hence a diſtinction between external and internal excretions. Of this kind is a fine vapour exhaling into the inteſtinal canal, which is really an internal perſpiration, which ſome have conceived to be converted into flatulence when digeſtion is defective.

Some have ſuppoſed that the electric fluid conſtantly pervades our bodies, being either abſorbed or diſcharged, ſo as to preſerve an equilibrium; and that diſeaſe may be produced by an exceſs or defect of it. It is certain

tain that our bodies contain a conſiderable portion of it, and it has ſometimes flowed off in viſible ſparks; and it is aſſerted that *Chriſtian* the IVth of *Denmark*, *Philip* the Vth of *Spain*, and others, have diſcharged it this way, when combing their hair, or changing their linen.

Exceſs of it is ſuppoſed not only to have killed an Italian lady, but to have conſumed a conſiderable part of her body to aſhes; and an accident which happened lately in France ſeems to countenance the opinion; the lady was in the habit of bathing with ardent ſpirit and camphor every night at bed-time.

Before I conclude this ſubject, I wiſh to engage the reader's attention to the following curious circumſtances.

1*ſt*. The ſurpriſing difference between our blood, a red fluid, and the humours ſecreted from it, of various colours, degrees of conſiſtence, and diverſity of ſmell and taſte.

2*dly*. The admirable manner in which the nutritive particles are ſelected from the whole maſs of blood, and diſtributed to that organ for which it is deſtined; for we may juſtly ſuppoſe, that a particle fit to nouriſh the pulpy ſubſtance of the brain would be very unfit

unfit to ſupply the place of a particle of bone or cartilage.

3*dly*. The no leſs wonderful manner in which the uſeleſs and noxious particles are ſeparated from the ſound and healthy humours by the excretory organs.

Notwithſtanding the many ingenious hypotheſes which have been advanced in attempting to explain theſe very curious circumſtances, they have been hitherto, and perhaps ever will be, inſcrutable.

Some phyſiologiſts have ſuppoſed that the ſeveral humours enumerated above exiſt diſtinctly in the blood, and that the different ſecretory organs are only mere ſtrainers. But this conjecture is not well founded; for bile does not exiſt in the blood before it is prepared in the liver; and the ſame remark applies to the other humours. For though the conſtituent principles of all the ſecreted humours are to be found in the maſs of blood; yet they are variouſly combined in the glands; and from this diverſity of combination they chiefly derive their peculiar qualities.

§. 87. The *qualities* of the body are ſuch circumſtances as regard the general form of the

the body, and the diſtinctive marks of particular conſtitutions, derived from the frame of the body, the countenance, the aſpect of the eyes, the colour of the ſkin, the texture of the muſcles, the ſtate of the pulſe, &c. If the phyſician is not converſant in all theſe circumſtances reſpecting the body in its healthy ſtate, it will be impoſſible for him to judge accurately concerning the changes they undergo by the effects of diſeaſe. He ought to be an acute phyſiognomiſt; that, in the contemplation of the countenance, the index of the mind, he may not only diſcern the changes in the ſtate of the body, but the operation of the paſſions, in caſes where the patient, from delicacy, or other motives, may be unwilling to reveal the true cauſes of mental perturbation and diſtreſs.

There have been many inſtances of this kind of medical ſagacity, by which the genuine ſources of diſeaſes have been diſcovered and removed; which would otherwiſe have been inſcrutable and fatal; and therefore a profound knowledge of the human heart and character is more eſſentially neceſſary to phyſicians than to any other order of men.

§. 88. *Simple*

§. 88. *Simple Morbid Affections of the Natural Functions.* In conſidering theſe, I ſhall conſtantly refer to thoſe ſections in the preceding part of the work, which treat of ſimilar affections of the ſimple fibres, and of the animal and vital functions.

§. 89. The organs adapted to the natural functions being compoſed of ſimple fibres, they muſt neceſſarily be ſubject to all their affections, p. 8, §. 4.

§. 90. As the blood circulates thro' them they muſt partake of its morbid changes, p. 9, §. 6, and thoſe of morbid inteſtine motion, p. 138, §. 62.

§. 91. As theſe organs are *peculiarly* endowed with ſenſibility, they are neceſſarily liable to all the morbid affections of the nerves, p. 18, §. 10, and to all the effects of ſympathy, p. 22, §. 11; and part of their ſtructure being muſcular, they will partake of all the morbid affections of muſcles, p. 28, §. 13.

I have however ſome particular remarks to make on nervous and muſcular affections,

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in this chapter, which could not be ſo properly taken notice of before; and which peculiarly belong to this place; the ſtomach and inteſtinal canal being the grand ſeat of ſuch diſeaſes as are commonly called nervous; thoſe eſpecially which go under the denomination of hyſterical, hypochondriacal, and melancholic.

It may be proper to remark, as explanatory of the different kinds of morbid ſenſibility, that there are certain invariable laws in our ſyſtem by which the effects of ſtimulus, whether natural or morbid, muſt conſtantly be regulated. 1*ſt*. An organ habituated to a weak ſtimulus, is very much irritated and diſturbed by a ſtronger: thus the eye is exceedingly dazzled by tranſition from a weak to a ſtrong light; and water drinkers and plain feeders are much diſordered by high ſauces and ſtrong drink. 2*dly*. An organ long uſed to a ſtrong ſtimulus will not be properly incited by a weaker; as, being long in a ſtrong light, we cannot ſee in a weaker; and ſtrong wine will not gratify the ſtomach of an habitual dram-drinker. 3*dly*. When the organ has been long habituated to a ſtrong ſtimulus, it becomes ſo torpid, as to

be inſenſible to their impreſſion: this explains *Buffon*'s experiment of red ſilk on white paper; and why brandy tipplers have had recourſe to rectified ſpirit. *4thly*, When the immediate effect of a ſtrong ſtimulus ceaſes, debility, torpor, or both, follow; hence tremor of the hand after a debauch, and palſy after convulſion. *5thly*. The degree of irritation does not always depend ſo much on the quantity, as on its being adapted to the nature of the organ: thus we can excite vomiting by tickling the throat with a feather; though a wound of that organ will have no ſuch effect. Theſe general laws will explain many circumſtances reſpecting the morbid ſtate of the nervous ſyſtem, and will be occaſionally referred to hereafter.

I have remarked, p. 18, §. 9, that exceſs, defect, or perverſion of ſenſibility, are the only ſources of nervous diſeaſes. I ſhall conſider theſe ſeparately.

1ſt. It may be exceſſive, as when the ſtomach and bowels, which are very irritable organs, are diſturbed by very ſlight cauſes: Thus I have ſeen an hyſterical woman exceſſively vomited by a ſingle grain of ipecacoanha, and an hypochondriacal man very much purged,

purged, and extremely ſunk, by an exceeding ſmall doſe of rhubarb and magneſia :—a caution, by the bye, againſt the repeated uſe of even gentle purgatives, of which ſuch patients are very fond.

The upper orifice of the ſtomach, being exquiſitely ſenſible, if it be rendered more ſo by diſeaſe, becomes the chief ſeat of thoſe moſt diſtreſſing ſenſations of conſtriction, ſpaſm or cramp, heartburn, anxiety, ſinking, ſickneſs, and a kind of convulſive commotion to which hyſterical and hypochondriacal patients are ſubject; beſide many ungrateful feelings in the whole tract of the inteſtinal canal, though not in ſo exquiſite a degree.

Theſe ſymptoms however may be partly produced by exceſs or deficiency of *tenſion* already explained p. 133, when the whole tract of the canal, or any portion of it, is either too much ſtretched by its natural ſtimuli, or not ſufficiently ſo. Thus, before a nervous woman falls into an hyſteric fit, ſhe generally has the ſenſation of a ball aſcending through the ſtomach into the throat, which ſeems to be owing to flatus or vapour aſcending the cavities, and confined by a ſpaſmodic ſtricture: the uneaſy ſenſation is

extended, by ſympathy, to the heart, brain, and ſpinal marrow, the whole ſyſtem is thrown into the utmoſt confuſion, and the palpitative convulſion of the heart is propagated to almoſt every muſcle of the body, voluntary and involuntary: after repeated convulſive ſtruggles, the patient falls into a ſtupid ſtate, and awaking from thence finds herſelf fatigued, languid, and depreſſed.

Here we have, in quick ſucceſſion, three different morbid changes of the nervous ſyſtem; from exceſſive irritation to paralytic inſenſibility, and from that to extreme weakneſs; and during theſe changes there is not a function, an organ, or even a ſingle ſenſible fibre, that is not more or leſs diſturbed.

Some very irritable men undergo ſimilar ſenſations and ſufferings, though in a leſs degree; and from this explanation of the phœnomena of irritability, we ſee that there is but a very thin partition between exceſs and defect of ſenſibility, and can account why exquiſite ſenſibility ſometimes terminates in paralytic weakneſs; and irritable hypochondriacs may fall into melancholic inſenſibility.

2*dly*. *Senſibility* may be ſaid to be depraved, when there is not a due correſpondence between

tween the ſenſation excited in the nerve, and the idea excited in the mind. The difference therefore between this and the former is, that in ſimple exceſs of ſenſibility, the idea is exactly correſpondent to the ſenſation; that is, great pain, ſickneſs, or any other uneaſy ſenſation, produces a ſimilar impreſſion on the ſoul; whereas, in this, the idea is often incorrect or falſe; as in a hypochondriacal or melancholic perſon; inſtances of which are given §. 10, and more will be given hereafter.

Depraved ſenſibility is generally connected with exceſs of it, though there are exceptions. It appears more frequently in the organs of digeſtion than in any other part of the body: hence the ſtomach is often offended by many things which do not always diſagree *even* with irritable ſtomachs, as honey, rhubarb, wine, &c. Such perſons often have an averſion to ſuch articles of food, drink, or medicine, as were formerly agreeable: hence alſo the longings of pregnant women, diſagreeable ſenſations in the ſtomach allayed by uncommon foods, or by lime, chalk, coals, &c. and timidity and apprehenſion of danger from cauſes which cannot hurt them, ariſe from depraved ſenſibility.

Hypochon-

Hypochondriaciſm, both in males and females, ſeems to depend on exceſſive and depraved ſenſibility combined in various degrees, and hence the great variety, mutability, and ſtrange peculiarity of their feelings, which powerfully diſturb and derange every faculty of the mind.

When theſe nervous affections become inveterate, they are often followed by effects to be taken notice of under the next head.

But before I proceed, I ſhall make a remark which will tend to explain ſome circumſtances of depraved ſenſibility. I have remarked before, that a fine vapour exhales into the inteſtinal canal, as well as into every other cavity. Should the diſcharge of inſenſible perſpiration from the ſkin be checked at any time, it is more readily determined on the cavities of the ſtomach and bowels, than on any other part of the body. Hence we are able to account for ſeveral of the diſagreeable feelings of hypochondriacal patients: ſuch perſons are peculiarly ſubject to a kind of acrimony or ſharpneſs of humours which is generated in the excretory organs, and has by ſome authors been diſtinguiſhed by the name of land-ſcurvy, to

diſtinguiſh

diſtinguiſh it from ſea-ſcurvy. As the perſpiration is in ſuch patients very irregular, and eaſily checked, if it is diverted on the bowels, in the form of vapour, and if it does not, as ſome ſuppoſe, form a conſiderable part of the flatulence of which ſuch patients complain, it certainly irritates the nerves of thoſe organs, and excites various uneaſy feelings, and ſpaſmodic conſtrictions of different portions of the canal. In confirmation of this, I ſhall mention two caſes which led me to adopt this opinion. A very ſtudious clergyman became exceedingly hypochondriacal; but was ſuddenly relieved from his paroxyms of this kind, by an angry pimple behind his left ear; and this repeatedly. An hypochondriacal and gouty patient, who had miſſed his uſual fit of the gout, fell into a melancholy, but after ſome time had an eruption of a ſcurfy kind on one of his hands, and ſome little boils on his head, and in a few hours after this appearance, recovered his ſpirits, and became alert and cheerful. We know that gouty perſons can often predict an approaching fit by uneaſy ſenſations and flatulence in the ſtomach and bowels. In the two caſes now mentioned,

tioned, and ſeveral more which have ſince occurred to me, the relief obtained was probably not ſo much the effect of a trivial eruption, as that it ſhewed the acrid perſpirable matter was again determined to the ſkin; ſome of which, heſitating in the ſmall veſſels and glands, produced the eruption, as in the gouty ſubject it fell on the joints: gout therefore does not ſeem to be ſo much an exquiſitely nervous diſeaſe, as ſome have ſuppoſed, but rather an effect of a peculiar acrimony. Hence we can account why ſome women, having been nervous in the earlier part of life, have become hypochondriacal at or about their 50th year, and have at the ſame time irregular gout, which rarely, however, terminates in a compleat fit; owing probably to the conſtitution not being able to determine the acrid matter to the joints in any permanent degree. Hence we can account for the great temporary and ſometimes permanent relief which hypochondriacal and gouty patients experience from drinking the Bath waters, and uſing them as a bath, beyond any other remedy hitherto diſcovered; and this relief is obtained partly from their ſtimulating and invigorating quality, partly

from

from their reſtoring the perſpiration, and giving to the acrid matter a habit of afflux to its natural outlet, the perſpiratory veſſels of the ſkin.

In my occaſional viſits to the Bath Hoſpital I have always found a very conſiderable number of the patients with an eruption upon the body, which the common people call a ſurfeit, owing, they ſay, to heats and colds; and Dr. *Falconer*, one of the phyſicians to that excellent charity, informs me, that the proportion of ſuch patients is very conſiderable, and that they are almoſt always cured by a courſe of bathing. Theſe people are generally labourers, and expoſed to inclemencies of the weather, and obſtructed perſpiration whilſt hot; and this eruption often ſucceeds an imprudent uſe of cold drinks. It ſeems to be a ſpecies of the land ſcurvy, as is the leproſy in its various degrees, though it is now very rare in theſe temperate climates.

3*dly*. Deficient ſenſibility is of various degrees: When perſons are habituated to the uſe of high-ſeaſoned meats, or ſtrong drinks, the ſtomach cannot bear or digeſt ſuch as are inſipid; and perſons who uſe purges frequently, are obliged to increaſe the doſe, or have

have recourſe to ſtronger. In theſe inſtances the fault is rather in the defect of ſtimulus than of ſenſibility; but it ſuggeſts a moſt important caution, *i. e.* that perſons in health, the young eſpecially, ought not to habituate themſelves to ſtimulating foods and drinks, otherwiſe they create a neceſſity of gradually increaſing the degree of their ſtimulus, until they arrive at the higheſt poſſible: and hence it is that epicures and bon vivants totally deſtroy the ſenſibility of the ſtomach, and degenerate into dram-drinkers; becauſe nothing leſs ſtimulating will gratify the enervated organ;—a dreadful ſtate! by which the lives of thouſands have been embittered and ſhortened. Theſe and other cauſes may render the nerves of the ſtomach and bowels leſs or more callous and inſenſible; and no cauſe concurs more frequently in producing this effect, than ſevere and inveterate nervous affections of thoſe organs, which, from extreme irritability, gradually degenerate into a ſtate of palſy; and ſchirrous obſtructions of the liver, meſenteric glands, and coats of the ſtomach and bowels, precede that diſeaſed ſtate of the brain mentioned page 84, §. 39.

§. 92. The

§. 92. The organs which miniſter to the natural functions muſt be ſubject to all the evils enumerated §. 61, 62; to all the effects of ſuddenly diminiſhed and increaſed determination, §. 63; to the effects of general fever, which often exerciſes much of its violence on the digeſtive organs, and thoſe of ſecretion and excretion; and to inflammation, §. 65; and hœmorrhage, §. 66.——Many of theſe effects are the conſequences of ſuddenly diminiſhed determination in ſome remote part of the ſyſtem, and a ſudden fluxion of humours on the ſtomach and bowels, or ſome other outlet; inſtances of which I gave §. 63, and ſhall add a few more. Thus vomiting and purging in the different ſtages of fevers are effects of this increaſed determination; inſtances of it alſo occur in malignant and putrid fevers, when the abſorbed effluvia fall upon the bowels in the form of bloody flux; remittent fevers often terminate fatally in inflammatory congeſtions of the bowels; and gouty and other acrimonies recede from the joints to the lungs, ſtomach, and bowels.

§. 93. *Morbid Determination ſlowly increaſed or diminiſhed.* When the progreſſive motion of the blood is carried on rapidly, the changes of deter-

determination will partake of that rapidity, ſome of the effects of which I have mentioned above; but when it is ſlow and weak, the ſpecies of determination now taken notice of muſt take place in ſome degree.

It is on this principle we may account for many errors of the ſecretions and excretions.

1*ſt*. The ſecreted humours may, from the habit of fluxion, or determination, to particular organs, increaſe the diſcharge; of this we have examples in catarrhal defluxions, profuſe ſweats, and waſting diarrhœa, in ſlow fevers, and in other diſeaſes; and as a proof of this being the caſe, if we check the ſweat, the purging increaſes, and the reverſe; and when both are leſſened, the breath becomes oppreſſed, or the ſpitting more copious.

2*dly*. If ſecretion be increaſed beyond the healthy degree, and the abſorption be not in proportion, a variety of evils is produced; thus ſome kinds of phlegmatic cough, collections of tough phlegm in the ſtomach, diarrhœa, &c. may be the conſequences.

3*dly*. Another more complicated and dangerous degree of determination is, when it ariſes from a great impediment to the circulation through ſome other organs, in which the

the determination being neceſſarily diminiſhed, a greater determination takes place to thoſe cavities where there is the leaſt reſiſtance; as when a river, being dammed up, overflows its banks. Hence various kinds of dropſy from obſtructions of the lungs, liver, meſenteric glands, &c.

4*thly*. Another fault of determination, by which the ſecretions and excretions are very much depraved, is, when the abſorbents take up only the finer part of the fluids from the cavities, leaving the groſſer behind.

From this cauſe proceeds every kind of tumour or ſwelling both of the external parts, and internal organs, which are not accompanied with pain; hence œdematous ſwellings of the legs, ſwellings of the glands of the breaſts, wens, and other inſenſible tumours on the ſurface of the body, and ricketty and other enlargements of the bones, and from a ſimilar cauſe, various obſtructions of the ſubſtance of the heart, lungs, liver, meſenteric glands, &c. of the glands of the throat, and of the coats of the whole inteſtinal canal, as of the œſophagus, ſtomach, &c. by which they are thickened, their cavities leſſened, and their nerves compreſſed into a

ſtate

ſtate of inſenſibility. From a ſimilar cauſe are formed gall-ſtones, gravel in the kidneys, and puffy ſwellings and chalk-ſtones in gouty limbs.

Here I ſhall take notice of two kinds of ſlow fever which very often attend the effects of morbid determination, No. 3 and 4; the underſtanding of which is neceſſary in a philoſophical eſſay of this kind, and will conduce very much to explain my remarks on dietetic regimen.

In many ſlow diſeaſes there is a low irregular fever, which generally proceeds from a cauſe ſimilar in kind but not in degree to that which produces the fevers taken notice of under §. 64; that is, the blood, being denied a free paſſage through obſtructed organs and veſſels, excites the heart to more frequent contraction, to overcome the reſiſtance, and thus a ſlow fever may be produced *even* in a dropſy; but as the reſiſtance is formed gradually, and the progreſſive motion of the blood languid, it ſeldom riſes to any height, ſo long as the tumours remain indolent.

But various cauſes may increaſe the determination upon thoſe organs, diſtend their veſſels, and produce various degrees of inflammation. This

This ſtate ſuggeſts the idea of one kind of *hectic* fever, which continues during the inflammation of the organ; or if matter ſhould be formed, its ſtimulus ſupports or renews the inflammation, until the whole fabric of the organ is converted into a maſs of matter, and its functions are totally deſtroyed; as is evident from diſſections.

If the organ be membranous in its ſtructure, as the air-cells of the lungs, the ſtomach, inteſtines, &c. the ſurface of the membrane being inflamed, is covered with a yellowiſh glutinous ſerum, thrown out by the inflamed veſſels, ſimilar to that which is thrown off by ſpitting in inflammatory coughs, and which has been often miſtaken by the ignorant for matter, when conſumptive patients are ſaid to be ſpitting up their lungs.

Hence we can account why the hectic fever is more ſevere, as the ſtimulus is greater; and ſometimes very ſlow, or rapid in its progreſs.

The vulgar have no idea but of one kind of conſumption, viz. that of the lungs; whereas there are as many kinds of it as there are organs ſuſceptible of obſtruction and inflammation. We can eaſily account, from what

has

has been ſaid, why the low fever often becomes hectic.

What I have now ſaid concerning fevers, compleats the theory of that important claſs of diſeaſes, ſo far as is neceſſary to gratify philoſophical curioſity: though certainly not ſufficiently explicit for practical purpoſes.

5thly. We may alſo refer to morbid determination an enlargement of ſome organs, as if by an addition of their fleſhy ſubſtance: this has happened to the heart, liver, and ſome others; and under this head we may bring polypus of the noſe, &c. which is a fleſhy excreſcence, and the fungus vulgarly called proud fleſh on the ſurface of ulcers, and even of bones when ulcerated. In all theſe caſes it ſhould ſeem that there is a real extenſion of the ſubſtance, and of the veſſels that nouriſh them.

Something ſimilar to this is that ſwelling of veins called *piles*, which often burſt and diſcharge blood; and the formation of little bladders called hydatides, which adhere to the ſurface of the liver, inteſtines, &c. in dropſies, and have been found alſo floating in the cavities; they are ſuppoſed to be enlarged

enlarged lymphatic veſſels, but their real nature is not yet well aſcertained.

There is another fault of determination; when in conſequence of ſome previous inflammation, the ſerum or coagulable lymph ouzes through the ends of the veſſels, and, as it were, glues the contiguous organs to each other; as the lungs to the pleura, the heart to its covering, and the inteſtines to each other.

To avoid many ſubdiviſions, I ſhall juſt take notice, that bile is ſometimes determined to the ſkin, and produces jaundice; and that various diſcolourations of the ſkin, either from the birth, and called marks, or from diſeaſe, are effects of irregular determination.

6thly. Another ſpecies of morbid determination, and a very frequent and important one, is when our nouriſhment miſſes, as it were, its natural courſe, and, in various fevers, is hurried off by morbid determination through one or more of the excretions: this is one cauſe of the waſte of fleſh and ſtrength in thoſe diſeaſes. Another kind is when from ſome obſtruction of the meſenteric glands, or lacteals, by which the paſſage of the chyle to the blood is prevented

it paſſes off by the inteſtines: or, having been received into the blood, the particles of nouriſhment, inſtead of being retained, and applied to the nutrition of the ſolids, run off quickly by the bowels, ſkin, or kidneys, and produce what is called atrophy, or waſting: or, the bony matter, inſtead of ſupplying the waſte of the bones, may form a part of the ſubſtance of muſcles or membranes, inſtances of which we meet with on diſſection: or they may receive no due ſupply; and hence the bones have become quite ſoft and pliable.

7thly. If there ſhould be any taint, hereditary or acquired, in the ſecretory and excretory organs; where it is probable ſuch taints lurk, rather than in the whole maſs of blood, we can eaſily conceive how they may, by inteſtine motion, §. 62, p. 138, or by ſome other faculty of depravation which cannot be accounted for, aſſimilate the fluids, with which they mix, to their own nature: hence probably gouty, rheumatic, ſcrophulous, leprous, ſcorbutic, cancerous, and other acrimonies, producing correſpondent foulneſs of the glands or ſkin. This ſubject has been treated of §. 62, p. 138.

Animalcules,

Animalcules, or their eggs, may lodge ſometimes, in a very unaccountable manner, in particular cavities; and hence worms of different kinds in the ſtomach and bowels; and ſome of thoſe animals, the like of which are not to be found in nature, lurk in the liver, and other organs; and the Dracunculus, or Guinea-Worm, under the ſkin. The generation of theſe vermin is commonly owing to ſome fault of the digeſtive faculty.

§. 94. I ſhall cloſe this long chapter with a few remarks on faults of digeſtion, a very important ſubject.

1*ſt*. As a regular and perfect digeſtion, in every ſtage of it, muſt depend very much on a healthy ſtate of the circulating, ſecretory, and excretory ſyſtems; ſo, when the progreſſive motion of the blood is either exceſſive, as in fevers and other acute diſeaſes, or deficient, as in chronic diſeaſes, the appetite and digeſtive powers muſt be impaired in ſome degree; and therefore there is not a more certain preſage of returning health, than an increaſe of appetite and a good digeſtion.

2*dly*. As the good or bad qualities of the humours employed in the office of digeſtion muſt depend on the ſtate of the ſecreting or-

gans, ſo, when they are diſeaſed, the ſaliva, gaſtric, and inteſtinal liquors, the bile, &c. may be, from this cauſe, either too inert and aceſcent, or alcaleſcent, putrid, or tainted with ſome other acrimony; and conſequently the aliment can never be converted into good chyle during this ſtate of depravity. When the digeſtion is impaired, the acid acrimony is more frequently prevalent than any other; which ſhews that the acetous or vinegar fermentation often takes place in a weak ſtomach, from deficient alcaleſcency of the ſaliva and gaſtric lymph. Gout has been ſuppoſed to be a diſeaſe of indigeſtion, but it ſeems to be ſo rather ſecondarily than abſolutely: depraved digeſtion ſeems to be more frequently and intimately connected with hypochondriaciſm.

3*dly*. A regular digeſtion ſeems to be peculiarly connected with a healthy ſtate of the excretions: hence it is that conſtipation or diarrhœa, obſtructed perſpiration, or profuſe ſweats, are generally accompanied with a morbid ſtate of the digeſtive faculty. A due preparation of the chyle depends ſo much on a ſound ſtate of the inteſtines, that, if they are morbidly affected, it muſt not only be imperfect,

imperfect, but carry that imperfection through every other ſtage.

If, for inſtance, the bowels are locked up, and oppreſſed by their accumulated contents, the due mixture of the aliment with the digeſtive humours will not only be impeded, but the paſſage of the chyle through the lacteal abſorbents will be retarded. With reſpect to the connection between digeſtion and perſpiration, it will be explained in the eſſay on regimen.

4thly. Exceſſive and depraved ſenſibility tend very much to weaken the digeſtive powers, by changing that ſtate of the nerves of the ſtomach and bowels which diſpoſes them to be gratefully affected by the aliment, and properly excited to promote the periſtaltic motion of thoſe organs, and a due ſecretion of the humours: hence the various diſtreſsful feelings of nervous patients about the region of the ſtomach.

5thly. A torpid or paralytic ſtate of thoſe organs, in various degrees, muſt be accompanied with a weakneſs and laxity of their coats: hence it is that drunkards, eſpecially dram-drinkers, loſe all ſenſe of hunger; and diſcharge, almoſt every morning, great quan-

tities of viſcid or ropy phlegm, which is the natural mucus accumulated and perverted.

6thly. The paſſions of the mind, when exceſſive, very much injure digeſtion.

7thly. The effects of exceſs or deficiency in the quantity, or of the ſtimulating or other qualities of our foods or drinks, will be conſidered in another eſſay.

§. 95. From what has been ſaid concerning the morbid affections of the animal, vital, and natural functions, the morbid ſtate of the qualities §. 86, p. 190, may be eaſily underſtood.



CHAP.

CHAP. III.

General Observations on the Human Body.

Embriotic ſtate of Animals—of Man—different Stages of his Life—Antediluvians—Poſtdiluvians—Giants—Dwarfs—Proportion of Deaths at different Periods of Life—of Males and Females born—of Males and Females married—Proportion of the Mortality of different ſexes—Diſeaſes of different Countries—Relative Healthineſs of different Climates—Countries—Places—Of Temperaments in general—in particular—Diſeaſes of each——Comparative view of Mortality in two different Centuries—Probable Cauſes of Difference in this reſpect—Objections to the Suttonian plan of Inoculation.

§. 96. FROM various obſervations made on animals, eſpecially birds before they are hatched, it appears that all the ſolids are formed from the fluids, and therefore

fore are different from them only in the degree of conſiſtence. It appears alſo that as their firſt rudiments, in the embriotic ſtate, are formed from a part of our humours called the coagulable lymph, which nearly reſembles the white of the egg; ſo it is by this lymph that they are afterwards nouriſhed.

Though it is probable that all the parts of the chick are really exiſting at its firſt formation; yet ſome of them appear ſooner than others, eſpecially the heart, large blood-veſſels, and the ſpinal marrow; and the other organs afterwards in a certain ſucceſſion, until the animal is compleatly formed.

As nature is ſimple and uniform in her operations, we may by analogy, ſuppoſe that infant man is formed nearly in the ſame manner.

§. 97. When born, he is the moſt feeble and helpleſs of all the animal creation; his ſolids, even his bones, are ſoft, the nervous ſyſtem is very irritable, his heart larger in proportion, and his blood, and all the humours ſecreted from it, are much more bland and mild than in the more advanced ſtages of his life; when they become gradually more ſharp,

ſharp, pungent, and acrid, in proportion as the ſolids acquire more ſtrength and firmneſs, and the nerves become leſs irritable;—a wiſe proviſion of nature to accommodate the natural ſtimuli to the degree of irritability.

Infant man is the only animal that cannot walk ſoon after birth: his ſenſes of ſeeing, hearing, ſmell, and taſte, ſeem to be leſs acute for ſome time after birth: his ſenſe of internal feeling is very acute. He attains a ſtate of maturity, with reſpect to his corporeal powers, later than any other animal; though it has been doubted whether he is *now* ſo long lived as ſome of the brutes.

Man acquires his ſpeech very ſlowly; and though his memory is ſtrongeſt in youth, yet many years elapſe before his reaſoning faculties are matured, even by the moſt careful cultivation, without which he would remain in a ſtate of mental weakneſs almoſt equal to that of brutes; as is evident from the ſtate of *Madame Le Blanc*, the Poliſh Boy, and others, which had, by accident, aſſociated with other animals only from an early period of life. It appears, however, that what we acquire in our mental powers by culture and ſocial intercourſe with our own ſpecies, we

loſe

loſe in bodily ſtrength, agility, and inſtinct; thoſe wild people being found to excel very much in thoſe qualities.

§. 98. There are certain ſtages or periods in human life, when conſiderable changes take place.

The firſt period is that of dentition, or cutting the teeth, which begins generally about the ſixth month, and the firſt ſet is generally formed about the third year. This ſet is ſucceeded by another between the ninth and thirteenth years, and about twenty-one we cut the remainder. In ſome caſes the teeth have been renewed thrice, or even four times; and ſometimes very old perſons have renewed their teeth.

The growth of man is compleated about his twenty-fifth year, and remains nearly ſtationary to his fiftieth year, when his bodily and mental powers, his judgment excepted, gradually decline; his nerves become leſs irritable, his fibres more rigid; many of his ſmall veſſels ceaſe to be pervious, and become ſolid chords; his digeſtive organs and powers decline; the functions of aſſimilation and nutrition are more tardily performed; his vital

vital powers and circulation become more languid; and he gradually ſinks into the "*ſlipper'd Pantaloon, ſans eyes, ſans teeth, ſans* "*ſenſe, ſans every thing,*" except ſomething like a vegetable exiſtence.

Some ill-founded ſtories have been told of ſomething like a renovation of youth. The great *Lord Verulam* imagined that ſome medicines might have that effect; and the celebrated charlatan *Paracelſus* boaſted he was poſſeſſed of ſuch a remedy for old age, yet died a young man: but there are not any well-authenticated accounts of this retrograde motion of human life. It is certain, however, that as premature old age is often brought on by various irregularites; ſo its progreſs may be retarded by a total abſtinence from ſtrong drinks, and a ſpare diet, chiefly of milk and vegetables, and removal into a warmer climate.

Man is longer lived than almoſt any other animal. The extreme age of the Antediluvians can only be accounted for, on phyſiological principles, by ſuppoſing that the earth, its atmoſphere, and productions, muſt have been different then from what they are at preſent.

Of

Of the Poſtdiluvians, notwithſtanding ſome fabulous accounts of extreme longevity, it is probable, that *Parr* who died at 152, and *Jenkins* at 169, both Engliſhmen, were not exceeded by any in reſpect to long life; and yet Parr did not ſeem to have died from a natural decay, but in conſequence of a change of living from a ſparing to a full diet. It is not eaſy to eſtimate the age of man at a medium, for reaſons to be aſſigned hereafter.

From bills of mortality it appears that not more than two or three in 1000 attain the 100th year, and only one in 5000 exceed that age.

There is a conſiderable diverſity in the growth and ſtature of man. In ſome inſtances the growth has been enormous: a boy of twelve months old was four feet and a half high; another of four years had the voice, ſtature, ſtrength, and beard of a man. Similar inſtances have occurred in females. On the other hand, ſome dwarfs, at their full growth, have been from three feet to ſixteen inches in height. Some perſons have decreaſed in ſize and growth; a child which weighed twelve pounds at the birth, weighed little more than nine pounds at five years old,

old. Perſons as they advance to old age, generally decline both in weight and ſtature.

Unleſs we account the Patagonians to be a race of giants, there is no other nation hitherto diſcovered that can be deemed ſuch, though individuals of almoſt every country have equalled, and even exceeded them in ſtature.

Without controverting the truth of ſtories of the immenſe ſize of human bones, and even of human ſkeletons, many perſons have been known to meaſure from ſix feet and a half to ſeven feet and a half; a *Swede* in the ſervice of *William Frederick King of Pruſſia* meaſured eight feet and a half, and *Goliah* is ſuppoſed to have meaſured nine feet.

From what we have ſeen of man in his progreſs from his embriotic ſtate to his final diſſolution, it appears that the period of his corporeal exiſtence is very limited; and it may eaſily be conceived how much it is ſo, from the following calculation:—

Of 1000 perſons, 23 die in the birth, 277 from teething, convulſions, and worms, 80 from ſmall-pox, 7 in the meaſles, 8 women in child-bed, 191 of conſumption, aſthma, and other diſeaſes of the breaſt, 150 of fevers,

12 of

12 of apoplexy and lethargy, and 41 of dropſy, omitting other diſeaſes not ſo well aſcertained; ſo that only 78 of 1000 attain what may be deemed old age.

Or, if we take it in another point of view: Of 1000 perſons, 260 die within the firſt year, 80 in the ſecond, 40 in the third, and 24 in the fourth; and within the firſt eight years of life, 446, or almoſt one half of the number, are cut off by premature death.

It may not only be a matter of curioſity, but of real utility, to enquire into the cauſes of theſe events.

§. 99. The chief cauſe is the ſtructure of our body, compoſed of manifold organs whoſe movements are exceedingly complicated, and between which an exact correſpondence and harmony is indiſpenſibly neceſſary for the preſervation of health.

This correſpondence conſiſts

1*ſt*. In a free intercourſe of the brain and ſpinal marrow, through the nerves, with all the organs of ſenſe and motion.

2*dly*. In a ready and uninterrupted communication between the heart and every organ of the body, by means of the circulation.

3*dly*. In

3*dly*. In a due proportion between the organs and their natural ſtimuli; inſomuch that they may be excited thereby to perform their ſeveral functions or motions with eaſe, vigour, and conſtancy.

4*thly*. In a due diſcharge, by the various excretions, of all the ſuperfluous, uſeleſs, or noxious particles of our ſolids and fluids.

5*thly*. In ſuch a ſtate of the digeſtive organs, and thoſe appropriated to ſecretion and nutrition, that they ſhall prepare and diſpenſe nouriſhment ſufficient, and of ſuch quality, as may ſupply the daily waſte.

6*thly*. That ſuch a regimen, with reſpect to diet and various other circumſtances, be eſtabliſhed, as may contribute to effect all the purpoſes enumerated No. 1—5.

Beſides thoſe circumſtances of the general frame and nature of the human body which conſtitute a healthy ſtate of the organs and their functions, each perſon has a particular ſpecies and degree of health, reſulting from certain peculiarities of his conſtitution; and therefore the doctrine of temperaments is a branch of phyſiology.

The antient phyſicians paid more attention to this ſubject than the moderns; but they

they miſtook the true principles of temperament, ſuppoſing them to depend on the ſtate of the humours; whereas the ſtate of the ſolids, eſpecially of the nervous ſyſtem, is certainly the foundation of this diſtinction. Some of the moſt celebrated modern phyſicians, as *Boerhaave*, *Hoffman*, *Haller*, and *Huxham*, have not neglected the doctrine of temperaments.

The moſt careleſs obſerver muſt have remarked, that there is a manifeſt difference between the conſtitution of a ſtrong man, and that of a delicate woman; and between that of a perſon of a florid complexion, and another of a pale, ſallow aſpect; and as phyſicians are very rarely conſulted concerning the means of preſerving health, it is evident, that every perſon who juſtly eſtimates this bleſſing, ought to ſtudy his own conſtitution, and be acquainted with the diſtinctive ſigns of his temperament: for it is manifeſt, that the ſame regimen cannot be ſuited to different conſtitutions, any more than that the ſame remedies can be effectual in curing their diſeaſes.

§. 100. The *firm* temperament, or habit, is diſtinguiſhed by large prominent muſcles, firm

firm fleſh, and a robuſt frame. In ſuch perſons the pulſe is ſtrong and ſlow, which ſhews that the vital powers are ſtrong, the blood rich and denſe, the circulation vigorous, the ſecretions and excretions highly aſſimilated and alcaleſcent, and the nervous ſyſtem firm, ſteady, and not too irritable. Perſons of this habit have a ſtrong diſpoſition to high fevers and inflammatory diſeaſes.

§. 101. The *delicate* temperament is marked by a ſlender frame, ſoftneſs of the ſkin, and a ſuſceptibility of ſtrong impreſſions from ſlight cauſes. This temperament is, in every reſpect, oppoſite to the former, eſpecially with regard to the irritability of the nerves; and perſons of this habit are moſt diſpoſed to fall into nervous diſeaſes and low fevers, accompanied with manifold nervous ſymptoms. This peculiar tendency to acute feelings does not ſeem to proceed from a larger portion of nervous ſubſtance, but is probably owing to the ſlenderneſs of the fleſhy fibres, and of the cellular texture; and hence the nerves are not ſo much defended from impreſſions as in the firm habit, where the fibres are more groſs and tenſe; or

in the lax habit, wherein the cellular membrane is more lax, groſs, and copious.

§. 102. The *ſanguine* habit is known by a florid complexion. This florid, ruddy appearance is generally confined to the earlier part of life, and rarely extends beyond the middle age; it ſhews that the veſſels are too full of blood. The pulſe is full and ſoft. Perſons of other temperaments are apt to be ſanguine at particular times of life. In early life the fulneſs is chiefly in the arterial ſyſtem; in advanced life, in the veins. Such perſons are ſubject to fevers, and large diſcharges of blood; their fevers, at firſt inflammatory, are often putrid in the advanced ſtages.

§. 103. The *lax* or *phlegmatic* temperament is diſtinguiſhed by the fleſh being looſe and ſpongy, and the complexion pale and ſallow. In this habit the pulſe is weak and ſoft, and appears to be more ſo, as the cellular membrane is thick and looſe. This habit is alſo in ſeveral reſpects oppoſite to the firm; the vital powers are weak and languid, the circulation tardy, the texture of the

the blood looſe and watery, and the humours not ſufficiently alcaleſcent. In ſome perſons of this habit, the nerves are too irritable; but this is rather the effect of indolence, luxurious indulgence, or diſeaſe, than of the natural temperament. Aſthma, dropſy, palſy, profuſe diſcharges by the bowels and kidneys, and various maladies of the ſlow kind, are the diſeaſes of this temperament: when they are ſeized with fever, it is either very tedious, and in general attended with a conſiderable degree of inſenſibility, or with obſtinate agues.

§. 104. The *dry* habit is known by the frame of the body being lean and ſpare, and the complexion of a dark brown. This habit was termed by the ancients the melancholic or atrabilious temperament. It ſometimes continues from infancy to the end of life. The pulſe is generally hard and ſlow; the ſecretions commonly highly alcaleſcent.—Diſeaſes of the ſkin, as ſcurvy, commonly ſo called, and St. Anthony's fire, and melancholy, or hypochondriaciſm, are the moſt frequent complaints of this temperament.

I was in ſome doubt whether I ſhould take any notice of thoſe temperamental propenſities to particular diſeaſes, leſt I might impreſs the minds of individuals with unneceſſary apprehenſions; but there is no conſtitutional propenſity which may not be counteracted by due care and caution; and the means of preventing thoſe diſeaſes will be taken notice of in the Eſſay on Regimen.

From what has been ſaid, it may be inferred, that the difference of temperament depends on the degree of firmneſs of the fibres, ſtrength of the vital powers, irritability of the nerves, and the proportion between the veſſels and the fluids they contain.

The ancients ſuppoſed that certain diſpoſitions of the mind were connected with the temperaments, and the obſervation is not without ſome foundation.

From the preceding remarks, §. 99, &c. it muſt be evident that the neceſſary concurrence of ſo many circumſtances muſt render health very precarious; and therefore we may eaſily conceive that, beſide the conſtitutional propenſity of our bodies to diſeaſe, it muſt be much increaſed by irregularities and exceſſes; and that many of thoſe diſeaſes muſt unavoidably be fatal.

Some diſeaſes are more prevalent in one country than another; in the northern countries, ſcurvy, and diſeaſes of the breaſt; in hot ſeaſons and climates, fevers and fluxes; and the plague, in Egypt and Aſia Minor.

Sickly years are from 1 in 4 to 1 in 6 or 7 to the healthy. December, January, and April, are, from obſervation, found to be the moſt ſickly months; and June the moſt healthy in the year; and January is to June as 11 to 1.

When a particular diſeaſe prevails, it is called an epidemic. London, and other large cities, are ſeldom without ſmall-pox or meaſles. Once in four or five years an epidemic attacks a place; when it returns leſs frequently, it is in proportion more fatal. Females ſuffer more in the beginning of an epidemic; males at the end. If an epidemic ſets in ſmartly, its duration is ſhort, if ſlowly and by ſtarts, it continues longer.

Cities and large towns are much leſs healthy than villages and ſolitary houſes in the country.

It is not eaſy to determine, with any preciſion, what particular climates are moſt favourable to long life, becauſe there are in-

ſtances of it in every country; but it ſhould ſeem that the greateſt proportion has been found in *Great-Britain*, *Ireland*, and *Italy*.

Dr. *Franklin* aſſerts that the United States of *America* double their population once in 25 years; but this is certainly over-rated: Dr. *Derham* ſuppoſed that *England* would double its inhabitants only in 434 years; but this calculation is below the truth.

The following curious and intereſting circumſtances cannot be unworthy of the reader's attention.

1*ſt*. The proportion of males born to that of females is 14 to 13.

2*dly*. Of ſtill-born children, 1 to 15; of theſe 10 male to 7 female.

3*dly*. One in 33 are twins; 1 in 6500, 3; 1 in 20,000, 4; and 1 in a million, 5 are born at a birth.

4*thly*. London buries, of children under two years old, 39 in 100; Edinburgh and Northampton, 34; and in the country, from 20 to 28.

5*thly*. Fewer men are married than women; for 62 boys die to 53 girls; and 12 young men to 11 young women: and of married men to married women: there die $15\frac{1}{2}$ to $10\frac{1}{2}$ per cent.

6thly. Since the Reſtoration, the proportion of burials to births is conſiderably increaſed, from increaſe of luxury among the wealthy, and tea-drinking and intemperance among the lower rank: hence our offspring being more puiſny, more die in the proportion of 9 to 1 in 35 of convulſions; and ſo of other diſeaſes.

If we take two diſtant octenaries, or periods of 8 years each, the firſt from 1629 to 1637, the ſecond from 1734 to 1742, nearly a century diſtant; the following table will ſhew that the mortality of the latter is greatly increaſed, and I am perſuaded it is ſtill more ſo within the laſt 40 years.

1ſt Octenary, 1629 *to* 1637.

A.	Died within the month	6 in 15
B.	Of cutting teeth	1 in $8\frac{1}{2}$
C.	Of Conſumptions	1 in $3\frac{1}{2}$
D.	Fevers of various kinds	1 in 49
E.	Inflammation of the lungs	1 in 440
F.	Apoplexy and ſudden death	1 in 46
G.	Dropſy	1 in 21
H.	Palſy	1 in 307
I.	Rickets	1 in 32
K.	Agues	1 in 40
L.	Small-pox and meaſles	1 in 9
M.	Child-bed	5 in 51
N.	Jaundice	1 in 98

O. Aſthma

O. Aſthma	1 in	99
P. Colic	1 in	196
Q. Worms	1 in	439
R. Dyſentery	1 in	91

2d Octenary, from 1734 *to* 1742.

A. Died within the month, above	61 in	94
B. Of cutting teeth	1 in	$4\frac{1}{2}$
C. Conſumptions; thoſe who die after 15	nearly the ſame	
D. Fevers of various kinds	1 in	$3\frac{1}{2}$
E. Inflammation of the lungs	1 in	205
F. Apoplexy and ſudden death	1 in	13
G. Dropſy	1 in	14
H. Palſy	1 in	278
I. Rickets	1 in	3000
K. Ague	1 in	1100
L. Small-pox and Meaſles	4 in	21
M. Child-bed	1 in	11
N. Jaundice	1 in	78
O. Aſthma	1 in	19
P. Colic	1 in	39
Q. Worms	1 in	2225
R. Dyſentery	1 in	963

I ſhall now offer a few remarks on the foregoing table.

1*ſt*. The increaſed proportion of infants who die is truly alarming, owing partly to more infants being ſent to nurſe, and the cauſes mentioned No. 6 above.

2*dly*. The proportion of thoſe who died in the 2d octenary of acute diſeaſes, enumerated

rated under B, C, D, E, F, L, of the table is much greater than in the 1ſt, owing probably to the cauſes aſſigned: of dyſentery, the proportion is much decreaſed, becauſe the diſeaſe is very much ſo in civil life, it being now chiefly a camp epidemic: the more liberal uſe of vegetables in general may be one cauſe of its decline.

3*dly*. The proportion of thoſe who die of dropſy and palſy is conſiderably increaſed. Theſe two diſeaſes may with much greater propriety be deemed the repreſentatives of all chronic or ſlow diſeaſes, than gout, as Dr. *Cadogan* alledges; becauſe they are the effects of conſtitutional weakneſs, produced often by tedious diſeaſes, and generally cloſe the ſcene of life. I am clearly of opinion that the increaſe of thoſe diſeaſes is owing to the general uſe of tea, eſpecially among the lower ranks, and the increaſed price of proviſions beyond that of labour; and therefore the poor do not live ſo well as they did a century ago.

The uſe of the bark has diminiſhed the number of deaths from agues: Worms, or what diſeaſes were attributed to them, make much leſs havock than formerly; but I have always

always been of opinion, that they are much ſeldomer the cauſe than has been uſually ſuppoſed; and we now find that the internal dropſy of the head, the early ſymptoms of which were formerly miſtaken for thoſe of worms, is more frequent than was formerly ſuſpected. Rickets have almoſt entirely diſappeared; I believe the diſeaſe was not known here before 1540. But Scrophula has increaſed very much of late years, for very obvious reaſons. Fewer women die now in childbed than formerly; and I am perſuaded the number is conſiderably decreaſed ſince 1742, becauſe the method of managing theſe worthy and moſt uſeful members of ſociety is much better underſtood; and they are leſs frequently deſtroyed by hot rooms and heating drinks; and notwithſtanding the illiberal and abſurd reflections made againſt the frequent employment of men-midwives, they have, I am firmly perſuaded, ſaved many thouſands both of infants and mothers, not only by their ſuperior ſkill in treating their diſeaſes, but by inculcating a more ſafe and rational management of them.

In almoſt every other reſpect, however, the balance is very much againſt the preſent age;

age; and as an additional proof, it may be obſerved, that whereas 140 years ago only 36 children in 100 died under 6 years old; ſo lately as the year 1740, 45 3-5ths died under 5 years of age.

I ſhall cloſe this chapter with ſome obſervations on ſmall-pox and meaſles.

Though the meaſles are perhaps more epidemic this century than the laſt, yet they are, I believe, leſs fatal in their conſequences, not only becauſe the treatment is better underſtood, but the repellent plan has not been carried ſo far with reſpect to them, as that lately adopted with reſpect to the inoculated ſmall-pox; though the indications for the management of both diſeaſes ought in general to be nearly the ſame.

With reſpect to the ſmall-pox, there is reaſon to believe that it was more fatal forty years ago than in the preceding century. Even in 1742 inoculation was much leſs frequent than within the laſt twenty years, and a greater proportion of the inoculated died of the immediate effects of the diſeaſe than at preſent. But, with all the *apparent* advantages of the *Suttonian* plan of inoculation and preparation, I am convinced, from

painful

painful experience, that more perſons have died of diſeaſes conſequent of inoculation on that plan, than from the more moderate method adopted by the profeſſion ſeveral years before the *Suttons* began to inoculate.

When this plan was firſt introduced, (and eſpecially as modified by Baron *Dimſdale*, to whoſe ſkill and liberality the public is much indebted, whilſt the *Suttons* ſelfiſhly made a noſtrum of their practice) I readily adopted the method in the few caſes in which I was conſulted as a phyſician, conſidering it as a very valuable extenſion of Dr. *Sydenham*'s plan; but I was ſoon induced to change my opinion.

In 1766, when I reſided at *Andover*, ſeveral of *Sutton*'s pupils inoculated in that neighbourhood. Soon after ſeveral patients, chiefly women, applied to me.

Their complaints ſeemed in general to be complicated with hyſterical or hypochondriacal ſymptoms, a few were dropſical and conſumptive. Of more than 20 of theſe patients, ſeveral died; and in all I could trace their complaints up to the *Suttonian* inoculation. In 1780 I tranſmitted my obſervations on that ſubject to my ingenious friend

Dr.

Dr. *Duncan*, who publiſhed them in the 8th volume of his Medical Commentaries, to which I refer the reader; and ſhall juſt obſerve, that Baron *Dimſdale*, in his diary of the inoculation of the *Great Duke of Ruſſia*, ſeems to have abated conſiderably of the cooling and repellent regimen.

The ſmall-pox is a diſeaſe, in which the conſtitution relieves itſelf by producing an eruption of puſtules on the ſurface. It never happens, I believe, under inoculation, that the quantum of eruption is ſuch as either to endanger life, or ſpoil the complexion, unleſs the management has been very abſurd. The danger of the *Suttonian* practice ariſes from lowering the patient too much, ſo that the vital powers are not able to throw ſufficient matter on the ſurface; to which I will add, that expoſure to extreme cold has a manifeſt tendency to prevent a due eruption, and even repel ſome of the matter already diſcharged upon the ſurface; in conſequence of which many diſeaſes, as I have already ſaid, were certainly produced: whereas, if the patients had neither been prepared at all, much reduced in their regimen, or very unneceſſarily expoſed to the cold,

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cold, they would have had the diſeaſe in a ſufficiently mild degree, though all the morbid matter were thrown on the ſurface, and their future health ſecured, ſo far as it could depend on this circumſtance.

This opinion is confirmed not only by Sir *William Watſon*'s experiments at the Foundling hoſpital, but by the ſucceſsful practice of the late Mr. *Clarke* at Caſtle-Cary, who, inſtead of purging, gave his patients a gently ſweating medicine every night, till the eruption was compleated; ſo that the mode of determining the humours to the ſkin, more congenial to the nature of the diſeaſe, ſeems to have been fully as ſucceſsful with reſpect to the immediate iſſue, and I believe much ſafer with regard to future health.

On a peruſal of the foregoing pages in MS. Dr. *Falconer* aſſured me, that the late Dr. *Dealtry*, of York, had declared to him a reſolution of publiſhing a number of caſes in proof of the injurious effects of the *Suttonian* method under inoculation, but was prevented by death.

ESSAY

ESSAY II.

On the Difficulties of attaining Medical Knowledge; thoſe Branches eſpecially which relate to the Practice.

CHAP. I.

Difficulties ariſing from the extent of Knowledge preliminary to the Study of Medicine—Motives for publiſhing this Eſſay—Quackery countenanced from an opinion of the ſimplicity of the Medical Art—no Art more complicated—demonſtrated from the Education neceſſary for a Phyſician—His preliminary Education learned and extenſive—his medical Education comprehending various branches of Knowledge—Natural Qualifications of a Phyſician—his moral Qualities—his profeſſional Duties—Animadverſions on a Bath Noſtrum—Vindication of the practical Skill of young Phyſicians.

IT ſeems to be impoſſible to account for the general countenance and encouragement given to quacks and their noſtrums in

in this kingdom, any otherwiſe than by ſuppoſing that it proceeds from a prevalent and very ill-founded opinion of the medical art being ſo ſimple and eaſily attained, that neither learning, nor even a moderate ſhare of ſagacity, are neceſſary qualifications for the practice of phyſic.

To combat, and, if poſſible, totally remove, this dangerous impreſſion, I publiſhed MEDICAL CAUTIONS; but conceiving that ſo important a ſubject merited a more ample diſcuſſion, I have given in the firſt Eſſay a ſketch of the natural hiſtory of man;* and that nothing in my power might be wanting to the completion of ſo beneficial a purpoſe, I have ſubjoined this Eſſay, which, I flatter myſelf, will carry to the mind of every reader an irreſiſtible conviction of a moſt important truth, on which the healths and lives of thouſands may depend; viz. That *medicine* is a very extenſive and complicated ſcience, and conſequently that none but thoſe who have dedicated many years to the ſtudy of it as a ſcience, are in any degree competent to the practice of it as an art.

* I always mean this when I refer to Eſſay I.

The

The firſt conſideration is the extenſive knowledge preliminary to the ſtudy of the art itſelf.

As many valuable books have been written in the dead languages, not only on general ſubjects of ſcience, but particularly thoſe of medicine, a compleat knowledge of *Greek* and *Latin* becomes a neceſſary part of medical education; and for the ſame reaſon, a knowledge of ſome of the modern languages would not be improper; that of the *French* is eſſentially neceſſary.

Though *Geometrical* principles have not always been happily employed in medical inveſtigations; yet this noble ſcience is ſo neceſſary in conducting the mind to the accurate inveſtigation of truth, and the detection of error, that none of the other ſciences can be attained with any degree of preciſion without its aid.

Logic, or the art of reaſoning with method and accuracy, is perhaps more neceſſary to the phyſician than to any other man of ſcience, as he is chiefly guided by the rules of analyſis and analogy in his reaſoning on the manifold objects of medical enquiry.

Natural and *Experimental Philoſophy* are indiſpenſibly neceſſary, as preliminary branches of medical education; becauſe there is ſcarcely any circumſtance reſpecting the nature of the human body and its functions, whether in a ſound or diſeaſed ſtate, which can be clearly underſtood, without a previous knowledge of the laws of motion, gravitation, and attraction, and of the principles of optics, acouſtics, pneumatics, hydroſtatics, hydraulics, and mechanics.

That part of Natural Philoſophy, which regards the phœnomena and various changes of our atmoſphere and its meteors, is an indiſpenſibly neceſſary branch of medical ſtudy; becauſe they are not only conducive to the ſupport of life, and the preſervation of health, but often become occaſional cauſes of diſeaſes and death.

A knowledge of *Natural Hiſtory* in all its branches is peculiarly connected with medicine, for reaſons too obvious to be enumerated; inſomuch that *Botany*, which is one of its principal branches, is conſidered as a portion of medical ſcience, and *Anatomy* and *Phyſiology* are alſo branches of natural hiſtory, though more immediately belonging to medicine.

Theſe

Theſe are only preliminary branches of education, and we may add, that there is no accompliſhment neceſſary for conſtituting the character of a gentleman, which a phyſician ought not to poſſeſs in an eminent degree.

Thoſe branches of knowledge which are the immediate objects of medical ſtudy are numerous and important.

Anatomy and *Phyſiology*, as muſt be manifeſt to thoſe who have read Eſſay I. are the very foundations of medical knowledge; for the ſame reaſon that it would be impoſſible to rectify the faults of a watch, without previouſly underſtanding its anatomical ſtructure, and the uſes of its various parts, ſeparately, and in connection with each other.

Pathology is that branch of medicine which treats of the nature, cauſes, and ſigns of thoſe ſimple affections, which conſtitute compound diſeaſes, in a manner which will be explained hereafter. From the explanatory example of the watch, the connexion between this branch and the two preceding muſt be evident; for though they are curious and valuable objects of philoſophical contemplation, of which no perſon of liberal education

ought to be ignorant, it is the duty of the phyſician *only* to apply them to practical uſe in the cure of diſeaſes.

Noſology treats of the nature, cauſe, and ſymptoms of compound diſeaſes, and the method of arranging them into claſſes, orders, &c. according to their characteriſtical diſtinctions.

The knowledge of theſe branches only is merely an object of philoſophical curioſity, unleſs the following are alſo well underſtood; as they comprehend the means of preventing and curing diſeaſes.

Materia Medica, as the term imports, comprizes whatſoever regards the diſtinctive marks, and the nature and qualities, of all the animal, vegetable, mineral, and metallic ſubſtances, which are employed in the cure of diſeaſes.

Regimen comprehends every circumſtance reſpecting diet, exerciſe, &c. which are called the *non-naturals*, and are eſſentially neceſſary to the preſervation of health, and the cure of diſeaſes; and of this I have treated fully in the Eſſay on Regimen.

Chemiſtry is the art of reſolving the various ſubjects of the Materia Medica into their conſtituent

conſtituent principles, and of ſeparating the moſt active for medical purpoſes. But if we conſider this art in a more extenſive point of view, it forms a very eſſential part of experimental philoſophy, and contributes very much to the improvement of arts and agriculture.

Pharmacy, which is intimately connected with chemiſtry, is the art of preparing and compounding the various articles of the Materia Medica, ſo as to increaſe their power and efficacy.

Poſology treats of the doſes of remedies, accommodated to different ages and conſtitutions.

There is ſo intimate a relation between external and internal diſeaſes, their nature and cauſes, that the phyſician ought to be well acquainted with the principles of *Surgery*.

He ought, moreover, to be well informed concerning the hiſtory of his art in all its branches, the progreſſive ſteps of its improvement, the literary character of the authors who have written on each, and in what reſpect, and by what diſcoveries, they have contributed to the advancement of the art.

Having ſtudied the ſeveral branches enumerated above, not only under the direction of able profeſſors in each department, but by an attentive and laborious peruſal of a multiplicity of books on each ſubject; he finiſhes his academical ſtudy by an aſſiduous attendance on the ſick in hoſpitals, under the direction of an eminent phyſician, whoſe duty and office it is to explain the nature of each diſeaſe, point out the probable changes and event, and aſſign his reaſons for every ſtep he takes for the relief of the patient.

Though thus qualified to enter on the practice of his profeſſion, he cannot be entituled to public confidence, until, by a ſeries of rigid examinations on the different branches of his art, he merits and obtains a Doctor's degree from that univerſity in which he acquired his medical education.

I ſhall conclude this ſubject with ſome remarks on the natural and acquired qualifications, and the duties of a phyſician.

In his natural endowments, he ought to be a man of genius, quick, penetrating, ſteady, and intrepid.

In his moral qualities he ſhould be humane and generous, of the niceſt honour, and the ſtricteſt probity.

In the exerciſe of his profeſſional talents, he ought to regulate his practice by the principles of a ſound and conſiſtent ſyſtem, of which all the parts have been carefully arranged, the effects foreſeen, and all the poſſible contingencies provided for. His promptitude in preſcribing ought to be equal to his patience in deliberation; and having availed himſelf of every precaution to ſecure ſucceſs, he affords himſelf every poſſible means of attaining it.

If a new diſeaſe occurs, or if thoſe diſeaſes with which he is converſant aſſume an extraordinary aſpect, he will evince the advantages of a regular education, and of accurate analogical reaſoning, by quickly diſcerning the neceſſity of departing from the ordinary routine of practice, and of adopting expedients ſuited to the novelty or urgency of the caſe.

It is the duty of a phyſician to uſe his utmoſt endeavours to relieve his patient as ſoon as poſſible; and to reject no means for that purpoſe, from what quarter ſoever they may be ſuggeſted;—to preſerve inviolable his patient's ſecrets, not only thoſe which reſpect his bodily infirmities, but every circumſtance which

which may fall under his cognizance, and which it would be improper to divulge.

It is equally inconſiſtent with the duty and dignity of the phyſician to pretend to the poſſeſſion of noſtrums, or to *conſult with* any perſon who does; becauſe, in either caſe, he puts himſelf upon a level with thoſe empirical wretches, who are the bane of ſociety, and a diſgrace to our legiſlature and police.

And, finally, a phyſician who is duly impreſſed with a ſenſe of the utility and importance of his office, cannot fail to diſcharge his duty with aſſiduity, humanity and liberality.

I take this opportunity, and I deem it an act of juſtice, to obviate an objection made to the employment of *young* phyſicians, that they want experience; and as I am not in that predicament, my opinion will, I hope, have more weight. I have ſuppoſed that an attendance on hoſpitals and clinical lectures is an eſſential part of a phyſician's education; and do aver, without the hazard of being contradicted, that one year's experience thus obtained, under the guidance of rational principles, is infinitely preferable to what can be acquired by the routine practice of a century;

century; as will be evident to every perſon who has peruſed the preceding eſſay, and will read the following pages of this, with any degree of attention. And this muſt unavoidably be the caſe, not only in the other learned profeſſions, but in every art which is connected with ſcientific principles.

It is this ſcientific knowledge which diſtinguiſhes the learned divine from the illiterate ranter; the profound lawyer from the pettifogging attorney; the elegant poet from the St. Giles's ballad-maker; and the architect from the bricklayer and common carpenter.

Since my Eſſay on *Quackery* has been printed off, I have had an opportunity of examining a *Noſtrum* ſold by an Apothecary of this place, and which, it is rumoured, ſome phyſicians here have recommended.—But, I am perſuaded, rumour lies; not only becauſe it is derogating from the dignity of the profeſſion, and inconſiſtent with the duty of a phyſician, to countenance empiriciſm; but becauſe any man with a very moderate portion of chemical knowledge, and at the expence of 3*s.* 6*d.* may determine that

that the medicine which the vender has dignified with the title of *Æthereal Spirit*, is nothing more than dulcified ſpirit of vitriol diſguiſed with a little cochineal.

I ſhall, in the firſt place, enquire into the juſtice of Mr. T.'s claim to the credit of improving *Hoffman*'s anodyne mineral liquor, (for he does not deny that it is the ſame medicine, only that it is improved) and ſhall next give a ſhort hiſtory of this vitriolic preparation; and prove, irrefragably, that his pretenſion to improvement is fallacious.

Mr. T. alledges, 1*ſt*. That his medicine undergoes ſeven diſtillations. 2*dly*. That it has ſucceeded in caſes where *Hoffman*'s Anodyne failed. 3*dly*. That he prepares two ſorts of this ætherial ſpirit; a weaker, which he vends abroad; a ſtronger, which he reſerves for his own practice.

I ſhall conſider each of theſe in order:— 1*ſt*. The diſtillation is ſometimes neceſſary a ſecond time, when a ſulphureous ſmell of the ſpirit ſhews that a part of the unſaturated mineral acid has come over, either by the careleſſneſs or the avarice of the chemiſt; but if Mr. T. diſtils his ſpirit ſeven times, it is a proof that he is a very unſkilful chemiſt; for

for if none of the mineral acid comes over, even a ſecond diſtillation is totally unneceſſary; and were he to diſtil it ſeventy and ſeven times, he could not make it more perfect; and muſt ſuſtain a conſiderable loſs by its exhalation. But there is not, in truth, any neceſſity for diſtillation at all; for it may be prepared extemporaneouſly, according to the judicious direction of the laſt Edinburgh Diſpenſatory.

2*dly*. He aſſerts that it has ſucceeded where *Hoffman*'s Anodyne has failed. I anſwer, that the Anodyne liquor muſt have been unfaithfully prepared; for I am well aſſured, and can demonſtrate, that his medicine is nothing more than *Hoffman*'s Anodyne diſguiſed by a colouring matter which cannot add to its efficacy.

3*dly*. With reſpect to his alledging that he reſerves a ſtronger preparation for his private practice, there is more of empiriciſm than candour in the pretence; and the motive is evident. But if his pretence be well founded, why deprive the public at large of the benefit of the moſt efficacious preparation? As pure æther is the ſtrongeſt poſſible preparation, the vitriolic anodyne ſpirit might be made more

more powerful, by increaſing its proportion to the alcohol; but this will not render it more efficacious than the common preparation, as I ſhall ſhew hereafter.

I proceed to give a ſhort hiſtory of this remedy.

Every phyſician who is acquainted with the celebrated Dr. *Hoffman*'s voluminous works (and he does not merit the diſtinction who is not) knows, that his anodyne mineral liquor was compoſed of rectified ſpirit of wine combined with the *aromatic*, or, as the Pariſian Diſpenſatory calls it, the *ſweet oil* of vitriol, by means of diſtillation; and that he frequently ſubſtituted the dulcified ſpirit of vitriol in its place, in his preſcriptions. The only circumſtance that we do not know concerning this remedy is the proportion of the aromatic oil; the Pariſian Diſpenſatory directing only a part to be added, the Wirtemberg College being of opinion that the whole was added by Dr. *Hoffman:* if it was not, his anodyne liquor muſt have been weaker than the common dulcified ſpirit. On converſing with the late Dr. *Lewis* of Kingſton, a moſt excellent chemiſt, on this ſubject, he remarked, that the proportion of the aromatic

oil

oil was of no conſequence, becauſe by increaſing the doſe of the weakeſt preparation the ſame effect would follow; for the proportion of ardent ſpirit is ſo ſmall, that its quantity could be no exception to its being given in a pretty conſiderable doſe.

Æther, which is only a concentrated preparation of this remedy, was held for ſeveral years as a noſtrum, but the preparation is now well known; and the laſt edition of the Edinburgh Diſpenſatory has given a direction for making it, and has directed the dulcified ſpirit, or *Hoffman's* Anodyne, to be prepared by mixing one part of the æthereal ſpirit with two parts of alcohol; a much more judicious method of making it than that directed by the London or Pariſian colleges.

After what has been ſaid, it is not likely that Mr. T. is a more adroit chemiſt than Doctors *Hoffman*, *Lewis*, or *Morris*, (the latter of whom has made ſome judicious remarks on this ſubject) or that any man of common ſenſe will ſuppoſe that his chemical ſkill is ſuperiour to that of Doctors *Cullen* and *Black*, the former of whom was long profeſſor, and my preceptor in that branch;

and

and the latter now fills the chemical chair in that univerſity.

I have thought it my duty as a phyſician, and conſequently an avowed enemy to all empirical pretenſions, to offer my remarks on Mr. T.'s noſtrum; not only with a view to place this matter in a proper point of view, but for the information of apothecaries, who are not always *ſuch expert chemiſts* as their brother T.

I have for many years preſcribed *Hoffman*'s anodyne, and the dulcified ſpirit, indiſcriminately, not only in dropſies of every kind, but in other diſeaſes; and in gradually increaſed doſes, to more than twice the quantity Mr. T. directs; but as it is ſometimes apt, in a large doſe, to produce ſome uneaſy ſenſations in an irritable ſtomach, I often join a few drops of Tinctura Thebaica with it, which

[a] I find that Dr. *Falconer*, in his Treatiſe on the Bath Waters, vol. 1ſt, p. 425, gives the preference to the ſpirit of nitre, as a diuretic, and on converſing with that Gentleman on the ſubject, he confirms that preference by ſubſequent experience.

Dr. *Falconer* gave, at my requeſt, to two perſons in the General Hoſpital 45 drops each of the dulcified ſpirit of vitriol, which could not be diſtinguiſhed from *Hoffman*'s anodyne liquor either in colour, taſte, or ſmell) twice a day, and to two others 45 drops (which is about 5-6th parts of Mr. T.'s largeſt doſe) twice a day

which increaſes its antiſpaſmodic, and even its diuretic powers, under certain circumſtances.

With reſpect to the diuretic effects of theſe dulcified acids, or ſpirit of nitre, which is of the ſame tribe,[a] they have ſometimes ſucceeded, but have often failed me; and phyſicians know well, that there is no excretion over which medicine has ſo little power as that of the kidneys.

They are certainly, however, much more to be depended upon as antiſpaſmodics, and in certain ſtages and circumſtances of fevers, where other anodynes might not be ſo ſafe or proper.

[a] day of Mr. T.'s Æthereal Anodyne Spirit. None of the above patients laboured under any obſtruction of the urinary ſecretion, therefore there was nothing to impede the efficacy of the remedies, and the ſeaſon was cool, being in the month of December. After a week's trial, two of the patients, viz. one that had taken the dulcified ſpirit, and one that had taken the Æthereal Spirit, had ſome increaſe, though but little, of the urinary diſcharge, the other two experienced no ſenſible effect.

Dr. *Falconer* likewiſe informed me that he had ſeen another perſon who had taken Mr. T.'s medicine for ſome time without any increaſed ſecretion by the kidneys, although there was no apparent cauſe in the health or conſtitution to prevent its exerting powers of that kind.

To

To conclude; I ſhall leave it to Mr. T. to determine how far he can reconcile his *pretenſions* as a noſtrum-monger, to his *credit* as a regular practitioner; eſpecially as his brethren have always been ſufficiently loud in their complaints, and with juſtice, againſt empirical encroachment and impoſture.

CHAP.

CHAP. II.

DIFFICULTIES RESULTING FROM THE MULTIPLICITY OF DISEASES.

Vulgar Error concerning the nature of Diſeaſes —Sketch of Dr. SAUVAGES' *plan of arranging Diſeaſes—Number near two thouſand—Diverſity of ſome particular Diſeaſes exemplified—Multiplicity of the Cauſes of Diſeaſes —Difficulty of connecting Morbid Affections with compound Diſeaſes exemplified.*

IT is a vulgar, but ill-grounded opinion, that of diſeaſes diſtinguiſhed by the ſame name, as *rheumatiſm*, *gout*, *conſumption*, &c. there is but one kind or ſpecies; whereas they are, in many inſtances, very numerous: for every circumſtance reſpecting diſeaſe, which conſtitutes an eſſential difference with regard to its nature, ſeat, ſymptoms, or method of cure, affords a juſt foundation for diſtinguiſhing the ſpecies, and even varieties of the ſame genus.

Thus, for example, *rheumatiſm* is a genus, of which there are ſeveral ſpecies; though nurſes and quacks, ignorant of neceſſary diſtinctions, recommend *one* infallible remedy for all, how different ſoever in their nature.

After many imperfect plans were formed for the arrangement of diſeaſes, the defects of which were diſcerned, but not corrected, by the celebrated *Sydenham* and *Boerhaave*; the late Dr. *De Sauvages* of *Montpelier*, after conſulting a multiplicity of volumes, and employing many years in digeſting his plan, publiſhed a large work, in which he arranged diſeaſes according to the botanical plan of reſemblance; in which he has been followed by *Linnæus*, Dr. *Cullen*, and others.

Sauvages's work is a valuable and important acquiſition, notwithſtanding its imperfections and redundancies, which I ſome years ago attempted to correct by the adoption of a new plan.*

To gratify the curioſity of the reader, I ſhall ſubjoin the outlines of Dr. *De Sauvages*' plan.

He divides the diſeaſes of the human body into 10 claſſes, 43 orders, and 315 genera.

* Commentaries on the Principles and Practice of Phyſick.

Each genus is again ſubdivided into a certain number of ſpecies and varieties, which, if we include the claſſes, orders, and genera, makes the whole to amount to nearly 2000.*

He defines each claſs, order, and genus, by certain characteriſtical marks or ſigns, by which they may be diſtinguiſhed from each other: by this method the memory is greatly aſſiſted, and much confuſion and manifold miſtakes are, in ſome degree, obviated.

To each of the claſſes, orders, genera, and ſpecies Dr. *Sauvages* has aſſigned names, expreſſive either of their nature or cauſes; and to an account of each ſpecies he has ſubjoined general methods of cure; and alſo ſuch peculiarities of treatment, as are adapted to particular circumſtances of the kinds and varieties of each diſeaſe.

From the multiplicity of diſeaſes, and their ſpecies and varieties, the reader may eaſily conceive, how comprehenſive and laborious the ſtudy of this branch *alone* muſt be; and how difficult the practice of an art, the objects of which are ſo multifarious.

* One great fault of this work is, that the Doctor has confounded ſimple morbid affections with compound diſeaſes; this error has been, in a great meaſure, corrected by Dr. *Cullen* in his Noſology.

Thus, of the diseases mentioned above, he gives of species and varieties of *rheumatism*, 10; *gout*, 14; and *consumption*, 17; and so of other diseases.

Another source of perplexity to the physician is, the multiplicity of causes which contribute to the production of diseases; and have a manifest tendency to change their nature or their aspect; and necessarily create a difference in the method of cure: I shall enumerate some of these causes.

1st. The nature of the human frame, limited in its duration, and unavoidably tending to dissolution, from the construction of its organs, the delicacy of its fibres, and the extreme minuteness and multiplicity of its vessels and tubes. As a machine, in which myriads of organs are in constant motion, it is not at all surprising that some of them should be disordered, or totally impeded, by excess, defect, or various irregularities of their *natural stimuli*;* but rather matter of admiration that we should be so seldom liable to disease.

* This term is fully explained in Essay I.

2dly. Temperament,

2*dly*. Temperament, or conſtitution, creates a conſiderable diverſity in the nature and aſpect of diſeaſes, as has been remarked in Eſſay I.

3*dly*. Different periods of life are not only ſubject to particular, diſeaſes but they have a tendency to change the appearance even of the ſame diſeaſe. The different ſexes have their peculiar diſorders.

4*thly*. Independent of all theſe circumſtances, we meet with ſome peculiarities of conſtitution, which have a conſiderable influence on the nature and form of diſeaſes.

5*thly*. The ſame obſervation may be extended to the influence of habit or cuſtom, as connected with our modes of living, and employments; hence it is that artificers, ſeamen, ſoldiers, &c. are either ſubject to peculiar diſeaſes, or the maladies to which they are ſubject, equally with the reſt of mankind, have often ſomething particular in their nature and aſpect.

6*thly*. The ſimple morbid affections* being very few, compared with the multiplicity of compound diſeaſes, of which they conſti-

* I have given a ſketch of all the morbid affections in Eſſay I.

tute a part, is one cauſe of a conſiderable perplexity; for as they occur in a variety of diſeaſes, often very different in their natures, it requires the utmoſt ſagacity, ſkill, and circumſpection, to diſtinguiſh the diſeaſe with which they are *really* connected, from others of which they may alſo conſtitute a part. This curious and intereſting ſubject merits an explanation.

Cough is a ſimple affection produced by ſome cauſe irritating one or more of the organs of reſpiration or breathing; and becomes one of the affections of ſeveral compound diſeaſes.

Dr. *Sauvages* has enumerated 19 ſpecies of cough, all of which are referable either to diſtinct cauſes by which it is produced, or diſtinct diſeaſes of which it conſtitutes a part.

Cough may be ſimply catarrhal, or what is commonly called a *cold*; or inflammatory, and connected with pleuriſy, peripneumony, various ſtages and degrees of conſumption, &c.; it may proceed from aſthma, various kinds of dyſpnæa or ſhortneſs of breath, ariſing from a multiplicity of cauſes irritating the nerves of the lungs; it may be connected with various ſpecies of ſore throat,

water

water in the breaſt, or in the ſubſtance of the lungs; it may be purely nervous, or ſpaſmodic; it may proceed from meaſles, ſmall-pox, and other eruptions; or from rheumatic or gouty matter fallen on the organs of reſpiration: it may be connected with diſeaſes of contiguous or remote organs, as of the heart, liver, ſtomach, bowels, &c.; and it often accompanies cutting of teeth, and worms, in children; and a variety of other diſeaſes.

The difficulty of determining to what diſeaſe this affection belongs, is only to be removed by knowing preciſely, and retaining in the memory, the particular affections which conſtitute every diſeaſe of which cough may poſſibly be a ſymptom. This may be illuſtrated by two examples.

Pleuriſy is a compound diſeaſe, conſiſting of four ſimple affections, viz. pain in the ſide, ſhortneſs of breath, cough, and fever. In this caſe cough conſtitutes apparently only one-fourth part of the diſeaſe.

Hepatitis, or inflammation of the liver, is diſtinguiſhed by a pain in the right ſide, often reſembling the pleuretic pain; difficulty of lying on the left ſide, ſhortneſs of breath,

breath, dry cough, fever, and ſometimes pain on the top of the ſhoulder, vomiting, and hiccup.

Here there are eight ſimple affections which unite in forming the diſeaſe, three of which do not conſtantly appear in every caſe; whilſt the others are common to both; for a pleuretic patient is often unable to lie on the ſide oppoſite to the ſeat of pain.

A careleſs or ſuperficial obſerver may miſtake one diſeaſe for another, and this actually happened in a caſe which fell under my own cognizance.

A phyſician, the quickneſs of whoſe imagination ſometimes perverted his judgment, declared a patient's caſe to be a pleuriſy, and treated it as ſuch; but upon inſpecting the body after death, all the organs ſuppoſed to have been the ſeat of diſeaſe, were found to be ſound, and the liver very much inflamed, and full of matter.

Many inſtances of ſuch miſtakes might be given; and if a man who has had all the advantges of a regular education, could commit a miſtake of this kind, how much more liable muſt thoſe be who have had few, if any, opportunities of medical improvement.

7thly. The

7thly, The multiplicity of occaſional cauſes which may create ſuch a change in one or more organs, as to pervert their functions, and produce diſeaſe.

I have entered fully into this ſubject under the Eſſay on Regimen; ſuffice it at preſent to offer one explanatory example.

Air is indiſpenſibly neceſſary to life, and is the natural ſtimulus to the organs of breathing; but it may be ſo depraved in its qualities, as either to become a preternatural ſtimulus, and produce diſeaſe; or a noxious ſedative, and ſuſpend or deſtroy the powers of life.

Hence it is indiſpenſibly neceſſary that the medical man ſhould underſtand the qualities and effects of cold, hot, moiſt, and dry air, and all the combinations of theſe; the nature of all factitious and mephitic airs, lightning, &c.; otherwiſe it will be impoſſible for him to obviate their effects.

In like manner the nature and operation of all the other non-naturals ought to be accurately inveſtigated, either as being neceſſary ſtimuli for the ſupport of life and health; or as perverted into the cauſes of diſeaſe and death.

Thus

Thus wholſome foods and drinks are not only neceſſary and natural ſtimuli to the ſtomach and inteſtines, but the chyle produced from them becomes a natural ſtimulus to all the other organs of the body. On the other hand, it is incumbent on the phyſician to underſtand the operation, and foreſee the ſucceſſive effects of exceſs, or bad qualities, of every article of aliment, not only on the digeſtive organs, but in the various ſtages of circulation, ſecretion, nutrition, and excretion.

This muſt be a very complicated object of inveſtigation, and affords an additional proof of our art being founded on philoſophical principles, deduced from a ſtrict analogical reference to facts.

8*thly*. As it appears from what has been ſaid under the preceding ſections, that a variety of cauſes conſpire to the production of compound diſeaſes, it becomes neceſſary for the phyſician to aſcertain accurately, and compare with preciſion, the nature and qualities of each; and what ſhare, ſeparately and combined, they may have in the production of the diſeaſe. This is often a very arduous taſk, and requires a patient and deliberate inveſtigation,

inveſtigation, diveſted of hypotheſis, and conducted on the principles of ſtrict analogical reaſoning, grounded, as much as poſſible, on facts. A ſingle error in the chain of reaſoning, by leading to a falſe concluſion, may be productive of very dangerous practical conſequences.

Vomiting, for example, may proceed from manifold cauſes, and is an affection which accompanies many diſeaſes: Dr. *De Sauvages* has enumerated 37 ſpecies of vomiting, and its uſual concomitant *nauſea*.

Let us ſuppoſe that a phyſician is called to a patient labouring under this affection. From a conſideration of the temperament, former diſeaſes, and the patient's mode of life, together with the other ſymptoms which preceded, accompanied, or followed, the vomiting, he forms his judgment, whether the cauſe proceed from a conſtitutional delicacy of the nerves of the ſtomach, inflammation or ſchirrus of its coats, weakneſs of them connected with indigeſtion, &c.; or whether the cauſe be ſeated in ſome contiguous or remote organ, as the liver, inteſtines, ſpleen, kidneys, head, or breaſt, and affecting the ſtomach only by ſympathy; whether it be

connected

connected with fever, rheumatiſm, gout, &c.; or whether it proceed from the morbid ſtimulus of foods, drinks, medicines, or poiſons; and how many of theſe cauſes combine in its production. The intelligent reader may eaſily conceive, that very dangerous conſequences may proceed from a miſtake with reſpect to aſcertaining the genuine nature of the diſeaſe, of which this affection conſtitutes a part.

9thly. The genuine nature of diſeaſes is often rendered very obſcure by the influence of ſympathy.

Whilſt the body is in health, the various organs co-operate and aſſiſt each other, in conſequence of a general correſpondence eſtabliſhed by original laws of the ſyſtem. This co-operation is ſcarcely diſcernible in health, though it almoſt conſtantly tends to exaſperate and diſguiſe diſeaſes, in conſequence of the communication between one organ and another, by means of the nervous ſyſtem.

Thus vomiting is often produced by diſeaſes of the head, liver, kidneys, or inteſtines; complaints of the ſtomach frequently bring on head-ach, ſtupor, and delirium, and affect

the

the heart with palpitation, ſenſe of ſinking, and fainting.

In theſe, and many other ſimilar inſtances, the phyſician, notwithſtanding his anatomical and phyſiological knowledge, cannot always guard againſt deception, whilſt the ignorant, by miſtaking accidental effects for permanent cauſes, are perpetually blundering in their attempts to aſcertain the nature and ſeat of diſeaſes, of which I ſhall give ſome inſtances in another chapter.

There is another kind of correſpondence between the ſeveral organs, which depends leſs on nervous ſympathy, than on a communication eſtabliſhed by means of the circulation This alſo is a frequent ſource of error and perplexity in diſcovering the nature of diſeaſes.

In health every organ is ſupplied with a certain proportion of blood determined to it by the vital powers, with a degree of force or momentum adapted to the nature and functions of the organs.

But in diſeaſes, this proportion both of quantity and force is changed in an almoſt infinite variety of ways and degrees; and indeed theſe changes of determination conſtitute

ſtitute a principal part of almoſt every diſeaſe; as is evident from what has been ſaid in Eſſay I. under the head of Morbid Determination.

Without much care and precaution we may be deceived in attempting to diſtinguiſh which of thoſe irregular determinations are eſſential to the diſeaſe.



CHAP.

CHAP. III.

Difficulty of distinguishing Diseases by their Symptoms.

Symptom what—Symptoms leſs numerous than the Diſeaſes they accompany—the Neceſſity of knowing all the Symptoms of Health, Temperament, Diſeaſe, and even the Signs of Death—Errors in aſſigning Symptoms of one Diſeaſe to another exemplified—Sympathy often a Cauſe of Error—other Cauſes—A vulgar Error rectified.

A *Symptom* is an effect produced by a cauſe of diſeaſe, either felt by the patient, or remarked by the phyſician, and by which we diſtinguiſh the nature of a diſeaſe; this is is termed *diagnoſtic*.

Symptoms are but few compared with the number of diſeaſes of which they are the ſigns. If we except thoſe ſymptoms which come immediately under the notice of the phyſician, and which are not very numerous, all the others proceed from the feelings of the

the patient, which are either abſolutely painful, or ſo far diſagreeable and diſtreſſing, as to be more intolerable than even pain itſelf. Such are, ſenſations of cold, heat, thirſt, watchfulneſs, ſickneſs, languor, and anxiety; each of which appear in a great variety of diſeaſes different in their cauſes, ſeat, and nature.

The phyſician, before he can diſtinguiſh one diſeaſe from another, muſt know exactly the ſigns of life and death, of general health, and that of particular habits or temperaments, which are very numerous; for it is by a previous knowledge of theſe, and by comparing them with the ſigns of diſeaſe, that we can determine its ſeat, nature, and degree.

He ought to have an accurate remembrance of all the eſſential ſymptoms of every diſeaſe, that he may diſtinguiſh one from another. We have had an inſtance of an error in this reſpect, Chap. II. where one diſeaſe was miſtaken for another; but in no inſtance are errors of this kind made ſo frequently as with reſpect to fevers; which are of ſo complicated a nature, and ſo changeable, that the moſt ſagacious may err, and the ignorant ever do; and to miſtakes of this kind thouſands annually fall a ſacrifice.

Though the characteriſtical ſymptoms of *Fever* are but three, quick pulſe, increaſe of heat, and loſs of ſtrength, there are others which diſtinguiſh one fever from another; others again which are merely the accidental effects of ſympathy, and *even* of medicine or regimen. When a Lady Doctor, full of her medical importance, viſits her patient, and compares ſymptoms with Dr. *Buchan*'s deſcription, how can ſhe err in forming her diagnoſtic? It is impoſſible ſhe ſhould not, deſtitute as ſhe is of thoſe principles of phyſiology and pathology which no practical treatiſe can impart; and which nevertheleſs are abſolutely neceſſary for the accurate diſcrimination of ſymptoms, thoſe eſpecially which are eſſential to the diſeaſe from ſuch as are merely accidental, and probably the effects of bad management. What will be the reſult of an erroneous diagnoſtic? An erroneous and dangerous practice, which even Dr. *Buchan* (who I believe to be a good phyſician) might not be able to rectify.

Another difficulty ariſes from a ſingle ſymptom appearing in a great variety of diſeaſes; of this a ſtrong inſtance was given with reſpect to cough, and another in the

caſe of vomiting; and the judicious reader may eaſily conceive what ſtrange confuſion, and extreme hazard, may accrue from aſſigning either of thoſe ſymptoms to one diſeaſe, when it really belongs to another.

Another ſource of error is, miſtaking effects for cauſes;—an error into which the ignorant perpetually fall, and which is ſometimes apparently countenanced by men of ſcience, from a diſinclination to controvert prevalent opinions.

Dropſy is ranked among diſeaſes, though it is in truth but a ſymptom. This inaccuracy of language does not affect the practice of the ſkilful phyſician, but it certainly will miſlead thoſe who are unable to reaſon from effects to cauſes; for if one cauſe of this collection of ſerum in any of the cavities be miſtaken for another, the genuine nature of the diſeaſe cannot be known.

The power and influence of ſympathy create great difficulty. The ſymptom may appear in one part of the body, and the cauſe may be very remote; thus cough may proceed from cutting of teeth, &c. and vomiting from a diſorder of the head, of the kidneys, &c.

Another

Another great difficulty ariſes from the patients being unable or unwilling to give an account of their feelings.

Thus children, and perſons that are delirious, inſane, or in a ſtate of inſenſibility, are unable to deſcribe their feelings.

With reſpect to children, a vulgar notion has prevailed that nurſes are their beſt phyſicians; but it is erroneous.

A perſon intimately acquainted with the human frame, its nature, and its diſeaſes, has a thouſand advantages over thoſe who have gleaned a little bald experience, from which they can draw no uſeful information; becauſe they are deſtitute of that philoſophical analogy, without the aid of which experience is a mere meteor that leads only to deception.

There is a number of undeſcribable circumſtances in the pulſe, aſpect of the countenance, breathing, and even the poſture of the body, from which a judicious phyſician may draw a fund of information, of which the ignorant cannot poſſibly have any conception.

The ſame remark is equally applicable to perſons delirious and ſtupid in fevers, la-

bouring under faintings, or convulſions, and the melancholy, or outrageouſly lunatic.

Patients are often, from various motives, induced to conceal the cauſes of their maladies.

The phyſician's profeſſional knowledge, which conſiſts partly in a ſagacious developement of the human heart and character, affords him a clue by which he may penetrate into its moſt ſecret receſſes. Manifold inſtances of this might be given, but I ſhall only offer one, which hiſtory has handed down to us, of the ſon of King *Antiochus*, who was reduced to a ſtate of danger by an ardent yet concealed affection for his mother-in-law. His diſcerning phyſician alone could diſcover the cauſe: the ſequel is well known.

Theſe are a few of the manifold inſtances which might be adduced, of the difficulty of aſcertaining the nature of diſeaſes by their ſymptoms.

CHAP.

CHAP. IV.

DIFFICULTY OF DETERMINING WHEN AND HOW A DISEASE WILL END.

Superiority of Skill manifeſted by Prognoſtic—why—Artifices of the Ignorant—Why Men of Skill err ſometimes in Prognoſtic—Inſtances.

IN no reſpect is the ſuperiority of the man of ſkill over the medical pretender ſo clearly evinced, as his being able to foretell whether a diſeaſe will be of long or ſhort duration; and whether it will end in compleat recovery, another diſeaſe, or in death.

Prognoſtic implies a prophetic ſagacity, grounded on a muliplicity of circumſtances compared with each other with philoſophical accuracy, from which the phyſician weighs, as it were, in a balance, the probabilities for and againſt the event he wiſhes to inveſtigate.

It is evident, that, to make a juſt prognoſtic, a knowledge of the branches of the art enumerated Chap. I. muſt be attained with great accuracy. If (*e. g.*) we miſtake

one diſeaſe for another; are ignorant of the nature of the organ or organs which are the ſeat of the diſeaſe; how far they are or are not neceſſary to life; if we do not nicely eſtimate the degree of the diſeaſe on one hand, and the ſtrength of the conſtitution on the other; nor foreſee all the effects of medicine or regimen which may be preſcribed; in ſhort, if we have not a full and comprehenſive view of every anatomical, phyſiological, pathological, and noſological circumſtance, we muſt be totally incapable of predicting the event.

Let us ſuppoſe that a perſon is ſeized with a pain in the ſide. Of this Dr. *De Sauvage* makes thirty-ſeven ſpecies, with or without fever, produced either by different cauſes, or connected with different diſeaſes. The pain is nothing more than a ſimple affection producing a diſagreeable ſenſation, connected with various diſeaſes, ſome very ſlight, many very violent. If we attribute it to a ſlight cauſe, when it really ariſes from a dangerous one, or the reverſe, our prognoſtic muſt in either caſe be erroneous.

So in the caſe of Dropſy, chap. II. if I attribute that which is owing to diſeaſed organs,

organs, and which, for obvious reaſons, is ſeldom curable, to that which is a mere effect of weakneſs, and is often cured; or the reverſe; I muſt neceſſarily form a wrong judgment, and an erroneous prognoſtic.

To avoid the diſgrace of making a falſe prognoſtic, the ignorant and empirical avail themſelves of an artifice which men of ſkill diſdain to make uſe of; they determine to err on the ſafe ſide, and predict danger on every occaſion.

I have known more than one man, who, though groſſly ignorant, made uſe of this expedient, and announced danger in every caſe. If the patients died, their reputations were ſaved, becauſe they had foretold it; if they recovered, the Doctor's reputation was eſtabliſhed by an opinion that the patient was ſaved by his ſuperiour ſkill.

It may fairly be aſked, Do men of ſkill never err in prognoſtic? I anſwer, they frequently do; and for this ſeveral reaſons may be aſſigned.

Sometimes they do ſo from inattention or hurry; and none are more liable to it than thoſe who are immerſed in a multiplicity of buſineſs; who, depending too much on their

experience,

experience, do not attend to all the circumſtances, but are contented with a ſuperficial and imperfect analogy: but if ſuch men err with all the advantages of a liberal education, what are we to expect from the ignorant, who have no rational principles to guide them?

But a phyſician may err, how attentive and ſkilful ſoever he may be, and this unavoidably.

The diſeaſe may be ſo obſcure, and inſcrutable in its nature, as to baffle his utmoſt ſagacity: even here, however, the judicious phyſician, though he know not preciſely what the diſeaſe is, may, from the general principles of his art, an accurate examination of the ſtate of the different functions affected by the diſeaſe, and a ſtrict attention to all the changes it undergoes, eſpecially from the operation of medicines, attain to ſuch a knowledge of its general tendency, if not of its particular nature, as not to commit any eſſential error in the treatment of it, and, by patience and perſeverance, will generally ſucceed, if the diſeaſe be curable.

How does it fare with the ignorant under theſe perplexing circumſtances?

It

It muſt, in general, happen, that they are not conſcious of the difficulty; for as knowledge is neceſſary to the detection of error, ſo ignorance and diffidence are ſeldom concomitant: or ſhould a gleam of light break in upon them by accident, it only ſerves to redouble their embarraſſment, unable as they are of making uſe of a ſcientific analogy, the principles of which they do not underſtand.

I ſhall have occaſion, in the next chapter, to conſider ſome circumſtances which may tend farther to elucidate this ſubject.

CHAP.

CHAP. V.

DIFFICULTIES ATTENDING THE CURE OF DISEASES.

Prognoſtic of little avail, but as it leads to the proper Treatment of Diſeaſes—how it does ſo—Medical Art a Circle—Phyſician why compared to the General of an Army—The ignorant Practitioner to a Partizan—Materia Medica how divided—Remedies to be uſed in a certain ſucceſſion—exemplified—Errors in Medical Practice exemplified—Contra-Indication why the ſource of Perplexity—Regimen why neceſſary—how abuſed—Difficulty of managing Diſeaſes from a Change of their Nature—Danger from unſkilful Treatment—Why Phyſicians fail in the cure of Diſeaſes—Why the Practice of Phyſic in this kingdom is on a bad footing—various Cauſes aſſigned—The Improvement of the Art to be attributed to Phyſicians—Objections to this Opinion obviated—A juſt Tribute of Praiſe to Baron Dimſdale—An enquiry how far Nature may be ſaid to cure Diſeaſes—Allegations againſt the Utility of the Medical Art anſwered—Why Empiriciſm ought to be diſcouraged, and how.

WERE the art of prognoſticating the event of diſeaſes a mere matter of curioſity, or a ſpeculative trial of ſkill, it would be of no conſequence whether our predictions

predictions were well or ill founded; but this is far from being the caſe.

Every branch of our art is ſo intimately linked to, and connected with, each other, as it were in a circle, that ſhould a ſingle link of the chain be broken, every thing muſt be thrown into confuſion.

The judicious reader, who has peruſed the preceding chapters with tolerable attention, muſt anticipate me in the remark I am about to make,—That if a medical practitioner be deficient in the anatomical and phyſiological knowledge of the human body and mind, and the nature and cauſes of their manifold diſeaſes, as diſtinguiſhed by their peculiar ſymptoms, it will be impoſſible for him either to foreſee the event of the diſeaſe, or to cure it, unleſs by accident.

Thus it is that our art conſiſts of various parts arranged in a certain ſcientific order, each of which ought to be contemplated in ſucceſſion, and compared with each other, according to the rigid geometrical and logical rules of analyſis and analogy.

It may be proper, however, before we proceed, to explain a little more minutely the connexion between prognoſtic and practice.

It

It is evident that if we are ignorant of the nature of a diſeaſe, we cannot foreſee the event; but it is not ſo clear how neceſſary an accurate prognoſtic is to a ſucceſsful practice.

Let us ſuppoſe that a perſon complains of a pain in the ſide; it may be ſpaſmodic, rheumatic, or inflammatory, &c. If from all the circumſtances I know it to be ſpaſmodic, I foreſee that it will terminate ſoon, and without danger; if rheumatic, that it will probably be tedious in its progreſs, but ſcarcely dangerous; but if inflammatory in a high degree, that it will be rapid in its progreſs, attended with conſiderable danger, and may probably be fatal.

If I miſtake the third kind for the firſt, and am led to prognoſticate erroneouſly, this muſt evidently affect my practice; becauſe, deeming the diſeaſe ſlight, I neglect the early uſe of the moſt powerful means, and loſe an opportunity of ſaving the patient, which can never be retrieved.

If, on the other hand, I treat the firſt as a pleuriſy, I may bleed, or otherwiſe diſcipline, my patient into a ſtate of dangerous weakneſs; and increaſe the evil, inſtead of curing it. This is not a fictitious ſuppoſition, but grounded

grounded on truth; and this and ſimilar blunders are daily committed.

Indications of cure are thoſe circumſtances in the nature of a diſeaſe, which point out what is to be done for the relief of the patient; it is, in truth, a ſcientific plan laid down upon the principles of phyſiology and pathology.

If a phyſician be called to a patient ill of a pleuriſy; having aſcertained the diſeaſe, he aſks himſelf what are the general indications of cure? They are, to weaken the propulſive power of the heart, and the rapidity of the circulation, by which the inflammation of the pleura and lungs is ſupported: and to purſue this plan until all danger of an impoſthumation or mortification is anticipated; to uſe every means which may be conducive to the mitigation of the local inflammation; and to preſcribe ſuch medicines and regimen as, being *ſedative*, may leſſen the febrile commotion, and increaſed determination on the diſeaſed organ.

Thus the phyſician may be compared to the General of an army, on the point of giving battle to the enemy. From the force and arrangement of his enemy, he forms his plan,

plan, by which he provides for making the moſt vigorous attack where the moſt powerful reſiſtance is expected, for changing his plan as circumſtances may require, for throwing in aſſiſtance where it may be moſt neceſſary, and for rectifying errors as they may be occaſionally committed.

Having digeſted his plan, he then examines his *roſter*, and ſelects thoſe troops that are fitteſt for the moſt vigorous exertion, and ſuch as are beſt ſuited for an auxiliary reſerve.

In like manner the phyſician always forms his plan, before he examines *his roſter*, or the *Materia Medica*, which are the inſtruments by which he is to attack, and hopes eventually to conquer his enemy.

What does the ſhort-ſighted practitioner, or the ignorant quack? He acts like the raſh partizan; he falls on *pell-mell*, ignorant of conſequences which he can neither foreſee nor provide for.

He forms no plan, becauſe he has no principles upon which to ground it; he bleeds, bliſters, purges, &c. without being able to aſſign any other reaſon than that it has been cuſtomary to do ſo, and that perſons have ſometimes recovered by theſe means; but he has no conception of the nice diſcriminating

circumſtances on which a rational practice is founded.

In the caſe of dropſy, (*e. g.* of the belly) having formed an erroneous opinion of the nature and event of the diſeaſe, he with great confidence ſets about the cure with a remedy he deems *infallible*; becauſe, *like Mr. T.'s medicine*, and many more, it has ſometimes ſucceeded.

Should it even ſucceed in diſcharging the ſerum, which might be more certainly done by tapping; and has been done by a draught of cyder, butter-milk, and even water; what does he gain by it but temporary relief for a few days? becauſe it does not remove the radical cauſe, which, in nine caſes in ten, is abſolutely incurable, and the belly ſwells again. Will his infallible remedy ſucceed again? it is ten to one that it does not; and this, for reaſons ſufficiently obvious to men of ſkill, has ever been, and ever muſt be the caſe, with all the *infallible* remedies that ever were or will be invented; for, as a late excellent phyſician[b] remarked, though the ignorant boaſt of infallible remedies for every diſeaſe, a man of ſkill cannot afford a poſitive aſſurance of his being able to cure a cut finger.

[b] Dr. Gregory of Edinburgh.

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The *Materia Medica*, being very extenſive, is, for the ſake of preciſion and perſpicuity, divided into claſſes, orders, genera, and ſpecies. Some of theſe claſſes reſtrain the motions of the circulation when too violent, or increaſe them when languid. Some mitigate the ſenſibility of the nerves when too great, others increaſe it when deficient. Some promote the evacuations; others regulate or reſtrain them; and others are what are called alterants, or ſuch as are ſuppoſed to rectify faults of the blood and humours. Of each of theſe claſſes there are various genera and ſpecies, endowed with different degrees of power; and much ſkill is required in adapting the remedy to the degree of urgency, and the ability of the conſtitution to bear it.

The phyſician, in the caſe before us, having determined what to do, next reſolves how it is to be done; that is, he turns over in his mind the various claſſes &c. of the *Materia Medica*, and ſelects certain articles for the purpoſe.

Theſe muſt be exhibited in a certain order and ſucceſſion;—a circumſtance of great conſequence, in which the ignorant generally fail.

This,

Thus, in a colic, an old nurſe ſhall often give a doſe of Turlington, or *a doſe of gin*, when a purgative ought to be previouſly given; after which the hot remedies may not always be improper.

In all caſes, the moſt urgent indication, or that which ſtrikes more immediately at the moſt dangerous part of the diſeaſe, is to be firſt ſatisfied: Thus we bleed as early as poſſible in inflammatory diſeaſes; and we repeat it as often as it is neceſſary, until we have placed the patient as much in a ſtate of ſafety as can be effected by this article of the Materia Medica.

In caſes of danger, as many means ought to be uſed, tending to fulfil the ſame indication, as the nature of the diſeaſe requires, or the ſtrength of the patient will permit: Here alſo the ignorant often err, from being incompetent judges, either of the urgency of the diſeaſe, or what the conſtitution will bear.

Hence they are often remiſs in carrying the grand indication into effect, by not bleeding ſufficiently early, and copiouſly; and the patients either die of a mortification, or fall into a conſumption, from impoſthumation

of the lungs; or, like *Sangrado*, they bleed them within an inch of their lives; and cure the patients of a pleuriſy or fever, by diſciplining them into a dropſy.

Another circumſtance which often perplexes the ſkilful, and muſt ever embarraſs the ignorant, is what we call *contraindication*; that is, ſome circumſtance which forbids our either purſuing a very eſſential indication at all, or to the extent which might otherwiſe be neceſſary.

Thus exquiſite pain demands opium, and the nature of the diſeaſe may not admit of it. If I am called to a patient late in a pleuriſy, who has not been bled, he may be ſo far exhauſted by the diſeaſe, that I cannot, without hazard of deſtroying him, take away as much blood as may prevent impoſthumation or gangrene; ſo that I have only a choice of difficulties.

Another difficulty is, the proportioning the remedy and its quantity, with a reference equally to the nature of the diſeaſe, and the ability of the patient to bear it.

Here age, ſex, conſtitution or temperament, and a variety of other circumſtances, are to be taken into the account; and hence conſiderable

derable difficulty ariſes in adjuſting and accommodating remedies to all theſe.

Medicine alone is ſeldom ſufficient for the cure of diſeaſe. Regimen therefore ought to be called into its aid; and it ſhould be exactly adapted in its nature to that of the remedies, both being neceſſarily adverſe to the diſeaſe.

For this purpoſe, a very accurate knowledge of the nature and operation of the various articles of regimen becomes neceſſary: an important and extenſive object of ſtudy, with which few practitioners are ſo converſant as they ought.

The ignorant often counteract the ſalutary effects of medicine, either by neglecting appropriate regimen altogether, or by adopting ſuch as is of an oppoſite nature: Thus, in high fevers, hot rooms, cloſe curtains, and hot drinks, often effectually deſtroy the good effects of cooling remedies.

Diſeaſes often change their form and aſpect, and even their nature: it therefore requires much knowledge to mark the gradual tranſition from one ſtate to another. Thus, inflammatory fevers may become putrid, high fevers become low, and agues may be con-

verted into fevers of a remittent type: and the ſame happens, though not ſo frequently, or remarkably, in other diſeaſes.

This is often the reſult of bad management, which the unſkilful have not ſagacity to foreſee; nor, when it happens, to remedy; if they have not, as too frequently is the caſe, put it out of the power, *even* of men of ſkill, to avert the danger which their ignorance alone has created.

Do phyſicians never err in the management of diſeaſes? It would be illiberal and uncandid to aſſert that they do not; but their errors are comparatively few and trivial; and their ſcientific knowledge often enables them to rectify their errors, before it is too late; and to extricate themſelves from difficulties which the ignorant are neither able to diſcern, nor to compenſate, could they diſcern them.

But a phyſician's want of ſucceſs, in curable diſeaſes, is very rarely to be placed to his account. His moſt judicious plans may be counteracted by drugs bad in their kind, or unfaithfully prepared: he is often diſappointed by the negligence of nurſes, and the obſtinacy or whimſical prejudices of the patients or their attendants; and as many circumſtances

cumſtances of great conſequence, with reſpect to omiſſion or commiſſion, are moſt induſtriouſly concealed from him, he is thereby led to make a falſe eſtimate of the nature of the diſeaſe, and of the operation of his remedies.

He is often, *in this kingdom*, and *in this kingdom only*, of all the countries in Europe, called in ſo late as if he were merely to be employed to cloſe the eyes of the patient.

It is not my intention to fix obloquy on any order of men. Of the apothecaries, as of all other ranks in ſociety, there are men of various degrees of ability and merit; and, as I have obſerved in another eſſay, I doubt not but there may be *ſome*, who, without the credentials, may poſſeſs the ſkill of phyſicians; but they are rare; and the public is unable to diſtinguiſh them from their ignorant, and, generally, more preſuming brethren.

But apothecaries becoming preſcribers, and thereby departing very far from their original deſtination, is not to be laid to their charge; for they have been *abſolutely forced into their preſent ſituation*, partly by the abſurd cuſtom of this country, the only country in Europe wherein they are ſo employed; and partly from the eſtabliſhed fees of phyſicians,

which are here as much too high, as they are elſewhere mean and beggarly.

When a new diſeaſe ariſes, or common diſeaſes aſſume a new aſpect, it is the ſkilful phyſician *alone*, who, by the aid of eſtabliſhed principles, can deviſe a new mode of treatment, correſponding to the novelty of the caſe.

When the ulcerated ſore throat appeared in this kingdom, and the ordinary practitioners ſtood aghaſt at the ſudden and unexpected fatality of the diſeaſe; and many had fallen a ſacrifice to the baneful effects of this new epidemic; it was a phyſician[a] who diſcovered its genuine nature, and pointed out the remedy.

Forty years ago a pleuriſy was epidemic in our fleet, and many died under the uſual mode of treatment, until Dr. *Huxham* diſcovered it was of a malignant nature, and would not bear bleeding; the moſt eſſential remedy in the common pleuriſy.

It may be ſaid, that phyſicians arrogate too much, and that valuable remedies have been diſcovered by perſons who were not phyſicians; and of this the Peruvian bark is an in-

[a] The late Dr. Fothergill.

ſtance;

ſtance; the efficacy of which was accidentally diſcovered by an Indian. The fact is not to be diſputed; but it was reſerved for phyſicians, not only to regulate its uſe, even in the ſingle diſeaſe in which chance had ſhewn it to be beneficial; but to extend it to many other diſeaſes, of which none but the judicious could have any conception; as they alone could avail themſelves of rational analogy.

Another inſtance may perhaps be given, of the new mode of inoculation. But, beſides that the hint was evidently taken from the celebrated Dr. *Sydenham*; the practice was empirically concealed from the public, until a phyſician[b], who is an honour to his profeſſion, to his country, and to human nature, drew aſide the veil, applied it with great judgment to the leſſening of the danger of the confluent ſmall-pox, and modified its application in inoculation.

It has been alledged, even by ſome medical men, that we are often indebted to Nature for much of our ſucceſs; and that our patients would more frequently recover, if we interfered leſs with her ſalutary operations.

[b] Baron Dimſdale.

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I have made ſome remarks on this ſubject on another occaſion; but I ſhall alſo take ſome notice of it here.

The term *Nature* implies that our machine is directed and regulated by an intelligent, ſapient Being: but no ſuch agent exiſts in our bodies. The diſciples of the celebrated *Stahl* attributed this ſuperintending power to the ſoul; others have inſinuated, that our corporeal centinel is a kind of *good genius* which watches over its ſafety.

But manifold inſtances might be brought to prove, that what are called efforts of nature are nothing more than certain movements of our various organs, indiſpenſibly ariſing from the laws of animation and ſenſation: That is, when a ſtimulus, whether natural[c] or morbid, acts upon a ſenſible organ, it either reacts, if a muſcular organ, or if not, conveys to the mind certain impreſſions, always in a compound ratio of the degree of ſtimulus and of ſenſibility.

We have the moſt indubitable proofs that Dame Nature, (for this non-entity, like many other imaginary beings, has been perſonified

[c] This is explained fully in the Natural Hiſtory of the Human Body.

and

and converted into an old nurſe) inſtead of evincing any inſtinctive ſagacity, blunders as much, and as egregiouſly, as any quack or old woman in the kingdom; and in her attempts to relieve her ward, makes the very efforts which tend to its embarraſsment and diſtreſs. When a biliary concretion drops into the gall-duct, the cavity of which is generally too narrow to allow it to paſs, What does her ſage ladyſhip do? Were ſhe to act wiſely, ſhe would either ſend it back, or, by relaxing the duct, procure it an eaſy paſſage: But the contrary of all this happens; for the ſtimulated and ſenſible duct contracts upon and graſps the offending body; and by leſſening its diameter, increaſes the difficulty: The phyſician, on the other hand, corrects her blunder, and uſes a variety of rational means to enlarge the cavity, and promote the paſſage of the concretion.

On this occaſion nature does not act contrary to the laws of the conſtitution, but preciſely in conformity to them; the error conſiſts in expecting that ſhe ſhould act otherwiſe, and in attributing to her powers which ſhe does not poſſeſs.

[d] Dr. Moore. The

The ſame obſervation may be extended to every other diſeaſe, *even fever*; in the ſalutary termination of which ſhe is ſuppoſed to have ſo great a ſhare, that a very ingenious author has inſinuated, that nature and the nurſe do the buſineſs more rationally and effectually than the doctor; yet this gentleman has been ſo unaccountably inconſiſtent, as to employ more than half of his volume, in giving minute directions for the cure of thoſe very diſeaſes, which he had previouſly alledged were better managed by nature and her co-adjutrix.

Are there therefore no efforts of nature? None, in the uſual acceptation of the term.

Perſons (ſay nature's advocates) recover without the uſe of medical means: how does this happen? I anſwer, that the diſeaſe has been either very ſlight; or if otherwiſe, we may eaſily account for the accidental relief obtained, eſpecially in febrile diſeaſes.

During the different perverted determinations[e] of the circulation, in conſequence of febrile tumult, it may luckily happen, that by the burſting of ſome blood-veſſel, of the noſe for inſtance, the diſcharge may com-

[e] This term is explained in the Natural Hiſtory, &c.

penſate

penſate for the want of bleeding; or ſome of the excretions being thrown open, the want of emetics, cathartics, ſudorifics, expectorants, &c. may be ſupplied; as it is by theſe means phyſicians increaſe the evacuations. Hence it is that fevers, inflammations, and other diſeaſes, have ſometimes been happily terminated *by chance*, and not in conſequence of any deſign, concerted plan, or inſtinctive interpoſition of nature, as has been, very unphiloſophically, ſuppoſed.

The truth therefore is, that a ſkilful phyſician may render moſt eſſential ſervice, by a judicious mitigation of the conſtitutional movements when too violent, a proper direction of them when irregular, and a due excitement and ſupport of them when languid and depreſſed; and, after a more extenſive experience of forty years than has fallen to the ſhare of moſt men, I do moſt ſolemnly declare it to be my firm belief, that the medical art, if judiciouſly employed, may be moſt eſſentially uſeful in the preſervation of life, and the cure of diſeaſes.

The uncertainty of our art, and the ignorance and blunders of its profeſſors, have long been ſubjects of ſarcaſm and ridicule; from

from which a careful and attentive perusal of this essay, and another[f], will, I flatter myself, rescue it, in the opinion of the learned and judicious readers, who will readily acknowledge, that our mistakes in distinguishing, and our failure in curing diseases, are not so frequently, as is alledged, the result of ignorance or inattention; but because we are not endowed with supernatural intuitive powers, and cannot discern and accomplish, what it is impossible for finite beings to know and effect.

For besides the impediments to our success, which have already been enumerated, it is often impossible for us to save life, when from previous neglect, mismanagement, or the extreme violence of the disease, the physician finds the structure of the diseased organs to be so much perverted, that nothing but a miraculous interposition of the great Author of our being could possibly restore them.

But whilst medical men, with all the advantages of a regular professional education are accused of ignorance, presumption, and imposture; how exceedingly absurd and ridiculous must it be, for any person of common

[f] Natural History, &c.

mon ſenſe to conceive it to be poſſible that quacks and medicaſters can, in any degree, be competent to the care of health or the cure of diſeaſes, deſtitute as they are of every ſcientific principle; and who therefore can have no guide or reſource but what blind chance affords them.

Divinity, law, and phyſic, are juſtly deemed *learned* profeſſions; and legiſlative authority has limited the regular exerciſe of thoſe profeſſions to ſuch perſons *only* as are qualified by a regular education. However, the benign ſpirit of toleration has *permitted* religious empiriciſm, and *folly has countenanced medical quackery*; but the Courts of Weſtminſter have wiſely excluded illiterate interlopers.

But though no man of common ſenſe would rely on an enthuſiaſtic cobler for inſtruction concerning his moral and religious duties, or employ a taylor to defend his property in Weſtminſter Hall; yet, *ſtrange infatuation!* perſons not deſtitute of diſcernment in other reſpects, daily truſt their lives and healths to miſcreants, who are as little qualified to practice phyſic, as a cobler is to preach, or a taylor to plead a cauſe.

It

It may be ſaid, that from the extreme credulity and cullibility of the inhabitants of this kingdom, it will be impoſſible to ſtem the torrent of empiriciſm. I am, however, firmly perſuaded, that, were perſons of improved underſtandings thoroughly convinced that it would be their intereſt, and duty, to protect and ſupport the regular profeſſion of phyſic, ſuch is the force of example, that the ignorant would be gradually weaned from their attachment to quacks and quackery.



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